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(Automobiles)

Automobile Dealer and Repairer



A JOURNAL OF PRACTICAL MOTORING

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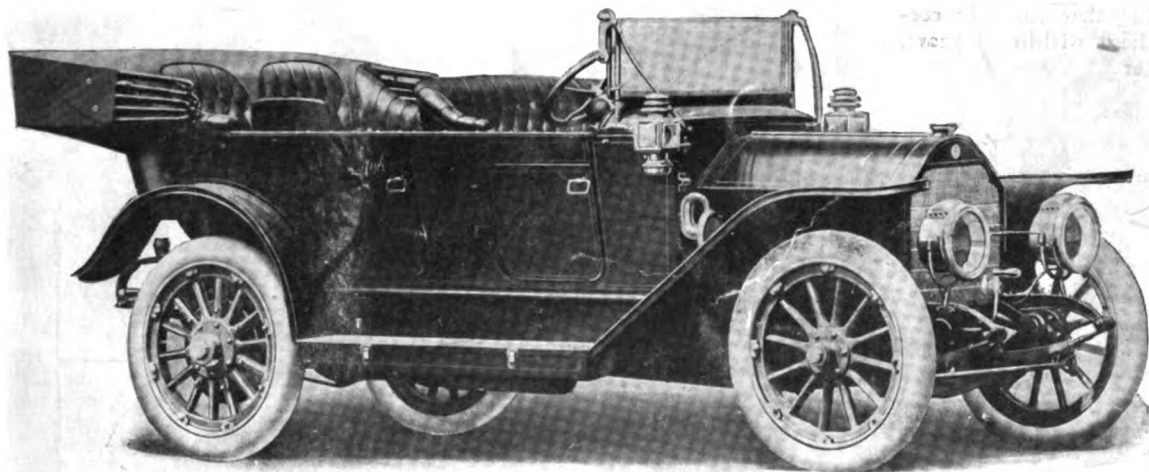
THE MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Vol. 14, No. 1.

NEW YORK, SEPTEMBER, 1912.

Monthly, \$1.00 per year.
Single Copy 10 Cents.

1913 Stoddard-Dayton "48" 1913



No Other Car at the Price has the Size, Style and Luxury of the Stoddard - Dayton "48"

THE "48" has no competitor, with an established place in Motordom, at nearly its price. It is one of the models which have built the enviable reputation of Stoddard-Dayton cars—which demonstrated that it is unnecessary to pay more than \$2800 for a car of real quality. The "48" is built for comfort, beauty and serviceability—its body is roomy, its

lines graceful and modern. Deep upholstery, long wheelbase and springs, powerful and quiet motor, are features to which Stoddard-Dayton "48" owners point with pride and admiration. A car which can be produced consistently for nine years, progressing steadily as new refinements and conveniences were adopted, is the kind of car which you want to own.

The specifications and equipment of the Stoddard-Dayton "48" include: 123-inch wheelbase; 36x4½ tires; Q. D. demountable rims; selective transmission; gas head lights and tank; Hartford shock absorbers; powerful brakes; ignition system with starter button; mohair top and boot; storm curtains; windshield; all tools.

Deliveries Now Dealers everywhere are prepared to make deliveries of the touring car and roadster models at once. We will be glad to send you the Advance Catalogue for 1913. Write for it.



UNITED STATES MOTOR COMPANY

6 West 61st Street

Stoddard-Dayton Division

New York City





Red

REGISTERED

PLATINUM POINT

Head

U.S. PAT. OFFICE

MAGNETO PLUG

We will replace, free of charge,
RED HEAD Platinum Point
Magnetto Plug that fuses or cor-
rodes from heat within 99 years,
no longer.

IF YOU expected any radical
changes in the RED HEAD
Platinum Point Magneto Plug, you
will probably be disappointed.

Despite our vast experience, gained
through powerful racing cars ranging
from 30 to 210 H-P., we have found it
impossible to improve upon the porcelain.
Neither could we improve upon the de-
sign of the crimped cap, brass bushing,
or the shell.

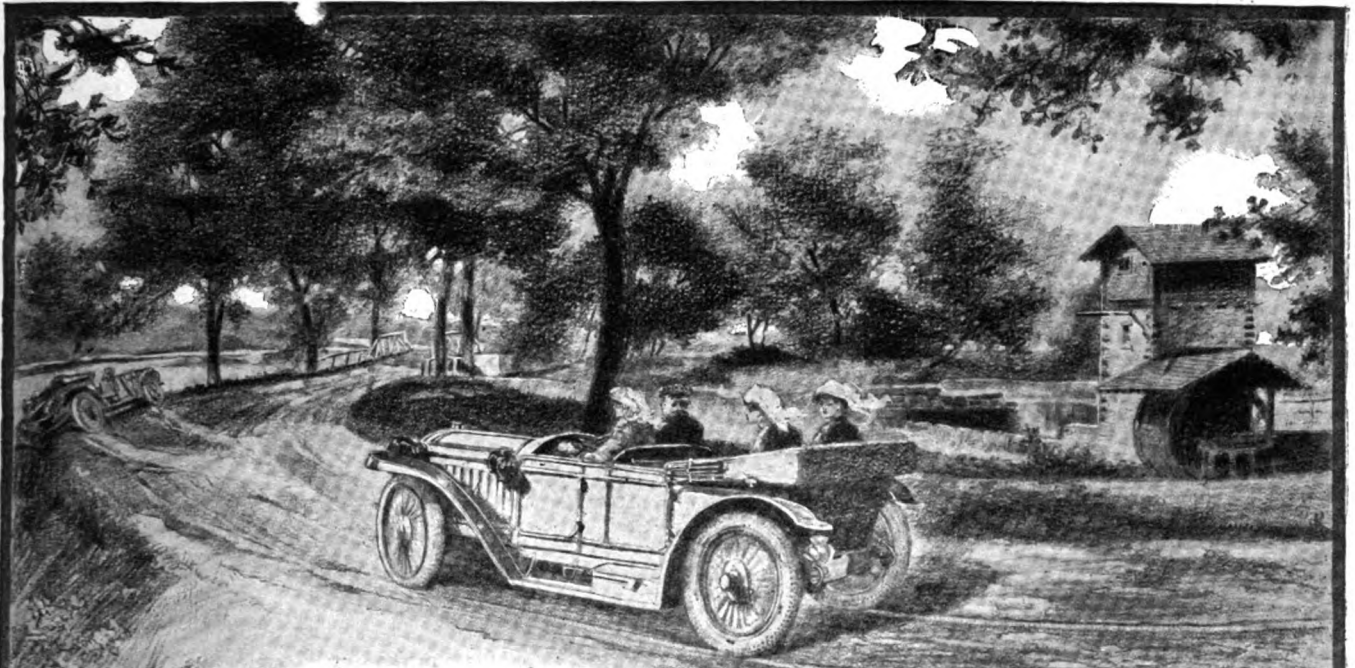
The RED HEAD Platinum Point Mag-
neto Plug is a concession to motorists
who use super-high tension magnetos
and demand a greater margin of safety
than to be found in imported meteor
wire electrodes used regularly in RED
HEAD Plugs.

The Platinum Point is 1-32" thick and
will stand more than 3,000° of heat
estimated four times greater than the
hottest spark delivered by any magneto.

All metal parts in the Platinum Point Plug
are highly nickelled. Each plug is packed in a
torpedo shaped wood box, decorated with a red,
black and silver label and red top. The plug
threads into the box, which protects the points
and prevents disarrangement of the spark gap.

Price \$2.00, including one set of RED
HEAD SPARK PLUG WRENCHES free
with every 4 plugs.

Emil Grossman Company, Manufacturer, 250 W. 54th Street, New York
Factory, 844 Woodward Avenue, Detroit



Security

on greasy roads is worth any trouble and expense it may cost.

Yet you can have perfect security from skidding, and save both expense and trouble, by using the scientific tire protectors

Woodworth Treads

You are buying trouble instead of service if you are running on bare tires—and the trouble costs more than the service, for **Woodworth Treads**, plus tires, cost one-quarter to one-half less per mile than bare tires alone.

Woodworth Treads last as long as ordinary tires, and cost half as much. Besides freedom from skidding, they give a tire life of from 10,000 to 20,000 miles without punctures, cuts, or repairs of any sort. Compare this with your present tire mileage; think of the constant vigilance and repairs needed to obtain fair service from bare tires; think of the money you are spending for the present near-service, where real service would cost less, and enable you to forget your tires during the life of the Treads.

Woodworth Treads have hardened steel studs riveted into a soft leather base. They cannot loosen and chafe, for their side springs hold them always snug. We guarantee their life, and will replace or repair, without charge, any tire damaged by them when applied as we direct.

What about your new Fall tires? Instead of buying pattern tread tires, look over your present rear shoes. If the fabric is still sound, repair the deeper cuts, and apply **Woodworth Treads**, at half the cost of new tires.

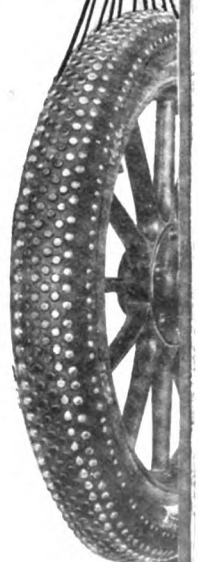
If your rear tires have been weakened in fabric, put them on the front wheels, and apply Woodworths over new plain tires on the rear wheels. After one season on Woodworths, you will never go back to the old expense and trouble.

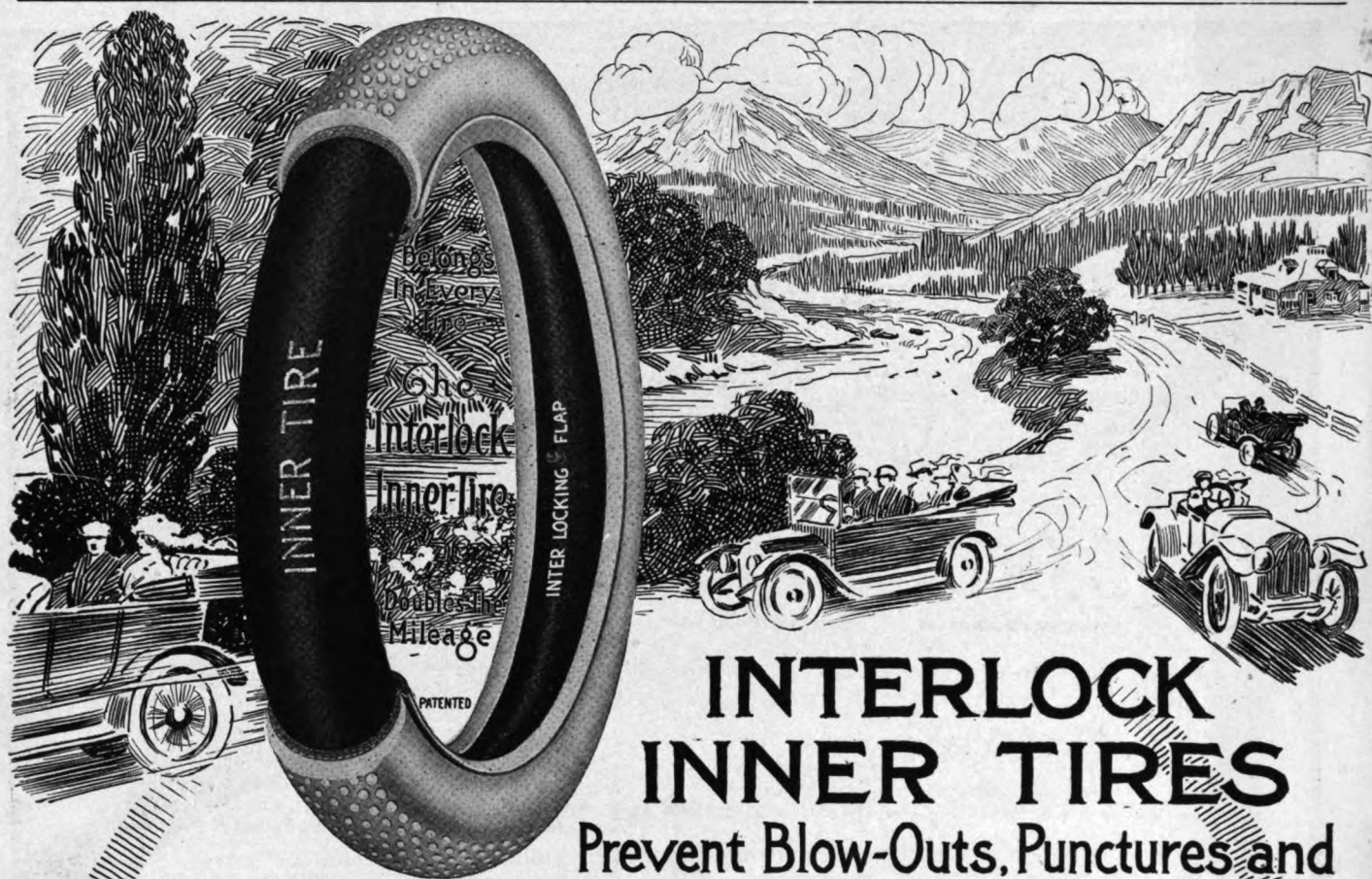
Our useful booklet, "The Preservation of Auto Tires," free on request. Mention this magazine.

LEATHER TIRE GOODS COMPANY
NIAGARA FALLS, N. Y.

NEW YORK STORE—1618 BROADWAY

Good Agents Wanted For Unoccupied Territory





INTERLOCK INNER TIRES

Prevent Blow-Outs, Punctures and

Double Your Tire Mileage

Thousands of motorists have discarded inner shoes, reliners, fillers and other reinforcement make-shifts and are using Interlock Inner Tires with the most satisfactory results. Interlocks actually double your tire mileage—save half your tire expense and stop your tire troubles. A set of new tires equipped with Interlock Inner Tires will carry your car an entire season without any tire troubles.

What Interlocks Are: Interlock Inner Tires are complete endless inner tires (not inner shoes) quickly and easily placed between the outer casing and the inner tube. They strengthen the outer case and protect the inner tube from punctures. The patented Interlock Flaps lock the Interlock securely, making it an integral part of the whole tire that flexes perfectly and cannot chafe, creep or heat. Interlock Inner Tires will hold even if the outer casing is broken, and can be used in old or new tires. They double the mileage of new tires and add 1,000 to 5,000 extra miles to old ones. Interlocks have a fine gray rubber finish, are smooth outside and inside and have no troublesome end joints or edges to cement.

Proved Best by Road Tests Interlock Inner Tires are the only tire reinforcement that has stood the exacting test of hard road work. Eight tires equipped with Interlocks have made over 7,000 miles each, a total of 56,000 miles, without a blow-out or any tire trouble. Interlocks used in tires that have gone 10,000 miles with the outer casings worn clear through have kept up with fast cars equipped with new tires and carrying extra tires. Interlocks have made a 4,500 mile cross country run—the last 1,000 miles over 20 mountain ranges without a blow-out or even carrying an extra tire. In the Four States Run Interlocks stood the test of hard fast road work under the critical observation of tire experts, without tire trouble. These and other hard public tests have proved the efficiency of Interlock Inner Tires beyond question.

Stop Tire Trouble Interlocks prevent the bother and delays of tire troubles and free you from the constant dread of trouble which spoils half the pleasure of motoring. If your tires are equipped with Interlock Inner Tires you can forget them and run your car the entire season without punctures—blow-outs and annoying tire trouble. Thousands of motorists testify to their satisfaction, safety and security.

Free From Faults Interlock Inner Tires do not affect the resilience of your tires as fillers and other makeshifts do and do not heat, chafe, creep or cause pinching of the rims. A perfect tire reinforcement.

Reduce Tire Expense Interlocks cost about the same as an inner tube and save their cost many times over in saving on repair bills—increasing your tire mileage and reducing your tire expense. They can easily be removed from an old tire and replaced in another. 90% of the tires are sent to the scrap heap before the rubber tread is half worn out because of blow-outs, rim cuts, etc. Interlocks stop the waste—make tires last longer and free you from the annoyance of tire troubles.

Increase Pleasure of Motoring A car is only as good as its tires. Interlocks make the tires even more dependable than the machinery. What would it mean to you to be able to start on a long run without any dread of blow-outs, punctures, tire trouble or even carrying an extra tire? How much would that sense of satisfaction add to the pleasure of your trip? Interlocks make automobiling a real pleasure free from the danger, dread, annoyance and expense of tire troubles.

They Insure Safety Interlocks give the extra fabric strength required to make the tire strong enough to stand the strain of road work. Tire manufacturers cannot make their tires stronger than they now are because they cannot increase the number of plies without the plies separating. Interlocks add 5 plies of strong practically puncture proof Laminated Fabric to your tire and prevent the danger of having your car ditched by the blowing out of a tire while going at full speed. This sense of safety against danger is worth more than the cost of a set of Interlocks.

We Guarantee Satisfaction

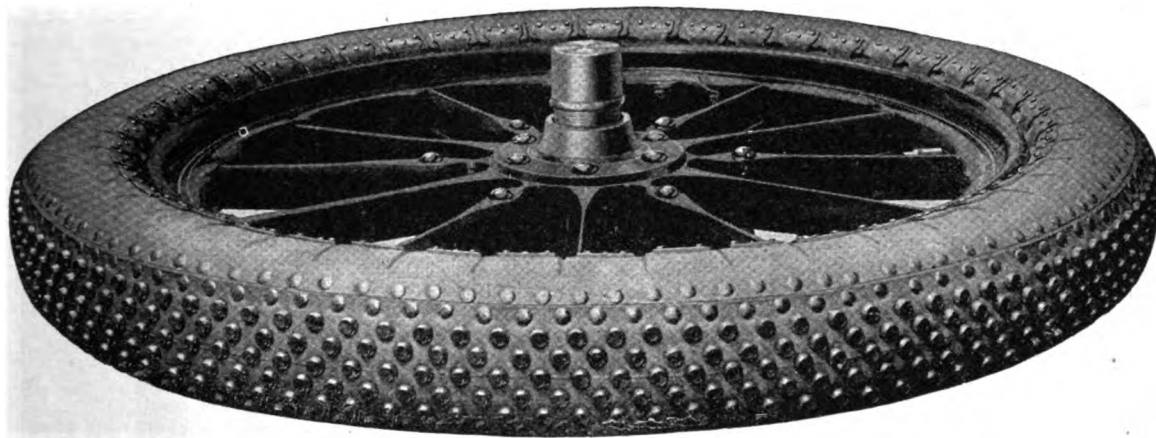
Interlock Inner Tires are good enough so that we guarantee absolute satisfaction to users, without the slightest reservation. Ask any of the many thousands of users of Interlocks whether they do what we claim.

Live Representatives Wanted Everywhere

Write for our booklets, data, prices and testimonials of users. Send us your address now. Use **Interlocks** and forget your tire troubles.

Double Fabric Tire Co.

18 West 9th Street,
Auburn, Ind.



Add 5,000 Miles to Your Tires

Don't throw away your old tires just because they are tread-worn or rut-worn. If you do, you throw away \$50.00 to \$200.00 in value. Your tires can be made to run 10,000 miles instead of 5,000.

The necessity of buying a new set of tires every season is a burden of the past. It is no longer necessary for you to submit to the delays, annoyances, and the endless trouble of puncture, blow-out and rim-cut.

can drive your car on wet streets or muddy roads with a sense of security and satisfaction such as you have never before experienced. If the assured possibility of doubling the life of your present tire equipment will interest you, let us tell you the wonderful story of **Durable Treads**.

Unightly and tire-ruining chains are made unnecessary. You

↘ Guaranteed 5,000 Miles Without Puncture ↙

Durable Treads are sold under an iron-clad guarantee to give you 5,000 miles of wear without puncture. We mean this—every word of it, and we want to prove it to you.

Motorists have anxiously awaited relief from the inherent weaknesses of the rubber tires—puncture, blow-out, rim-cut and skidding. The **Durable Tread** embodies in its design almost perfect protection against each of these. It is a success from every standpoint.

Our factory capacity has been doubled three times since January first of this year to meet the growing demand. Our sales have increased over 800 per cent in one year. This is an unusual record, but it is only the beginning. **Durable Treads** have not yet been introduced into one-tenth of the territory where they are most needed.

Durable Treads

Cost About ½ As Much As Tires

Durable Treads cost only about one-half as much as new tires, and we will deliver them at your door express prepaid. You cannot afford to overlook such a money-saving opportunity. Our special discount offer for new territory may enable you to secure a set of **Treads** at dealers' prices if you act promptly.

Our Offer

Durable Treads must do as we guarantee. If they fail, we lose—not you. With your permission we will ship you a pair or full set, express prepaid, for your inspection. You pay nothing in advance—you assume no obligation. If you are not entirely satisfied that **Durable Treads** will save one-half your tire expense and all your tire trouble, return them—that will end it. Can you afford to overlook such an opportunity?

COLORADO TIRE & LEATHER CO.
1208 Majestic Building, Chicago, Ill.
1027 Broadway, Denver, Colo.

Special Discount

If **Durable Treads** are not already represented in your locality, we will prepay the express charges on a shipment to you direct from the factory and allow you the full Dealers' discount.

We expect more business from your vicinity, and know that we can get it by a demonstration.

Send Coupon—Get Facts

If 5,000 miles added to the life of your tires interests you, let us send you the details of our special offer, copy of guarantee, and valuable Booklet. Mail this coupon to-day.

COLORADO TIRE & LEATHER CO.

1208 MAJESTIC BLDG., CHICAGO, ILL.

1027 BROADWAY, DENVER, COLO.

Dear Sirs:—Send me at once, without obligating me, a sample of your **Durable Tread** leather, your valuable Booklet, "5,000 Miles Without Puncture," a copy of your guarantee, and details of your special discount offer.

Name.....

Street Address.....

City..... State.....

My Tire Sizes are

4



K&W RELINERS

$\frac{1}{2}$ of 1%

That's the number of replacements that we have had to make during the four years we have had K & W Reliners on the market. The best of material, combined with the best of workmanship, are responsible for the superiority of K & W Reliners.

When a dealer tries to sell you "something just as good" as "K & W"—take the hint. Write us direct. Don't wait for blow-outs and punctures, but reinforce your tires now. Take time by the forelock and double your mileage. K & W Reliners will add 3000 to 5000 more miles to your tires—service practically equal to that given by new standard made tires.

The fabric is the life of the tire. By reinforcing the fabric you get many additional miles of service, besides making punctures and blow-outs impossible. K & W Reliners will easily reduce your tire expense 50 per cent.

When placed in an old casing, a K & W practically vulcanizes itself to the inner fabric and covers up all the cracks and worn spots; reinforces the whole tire in exactly the same way that an inside blow-out patch reinforces one weak spot.

The exclusive features found in K & W Reliners are fully covered by patents and cannot be found in any other reliner made. Every K & W Patented Reliner is backed by our positive guarantee of service and satisfaction.

Dandy Reliners.

As there are many instances where a Reliner would do all work required by reinforcing and preventing punctures (and sometimes not necessary to be made of as good material as our K & W Patent Reliners) we have decided to manufacture a reliable, low priced tire-reinforcement and have succeeded so well that "price and quality" will satisfy any one who is satisfied with any other tire protector on the market.

The Dandy Reliner is built wide. It will reinforce the casing at the edges. It is made of from three to five plies of heavy rubber duck. It is neatly made. It will fit the tire perfectly. It is heavily coated with cement—all ready to insert. It is semi-cured and very pliable. You will be well pleased with the Dandy Reliner.

We also manufacture a LIGHT WEIGHT Reliner made of "two" layers. The LIGHT WEIGHT is excellent for a tire that is "Rough Inside."

PRICE LIST.

	Dandy Reliner	Light Weight Reliner
28x2½	\$2.60	\$2.40
28x3	3.10	2.90
30x3	3.40	3.25
32x3	3.60	3.30
28x3½	3.90	3.50
30x3½	4.05	3.60
32x3½	4.30	3.75
34x3½	4.50	3.85
36x3½	4.70	4.00
30x4	4.90	3.60
31x4	5.20	3.80
32x4	5.40	4.00
33x4	5.50	4.20
34x4	5.70	4.30
36x4	5.85	4.40
34x4½	6.30	4.55
36x4½	6.65	4.80
34x5	6.80	4.85
36x5	7.00	5.25

Write for our K & W Tire Accessory Catalog, containing prices of our "Patent" Reliners. See your Dealer—if he does not sell K & W PRODUCTS, write us for a special price.

K & W MANUFACTURING COMPANY

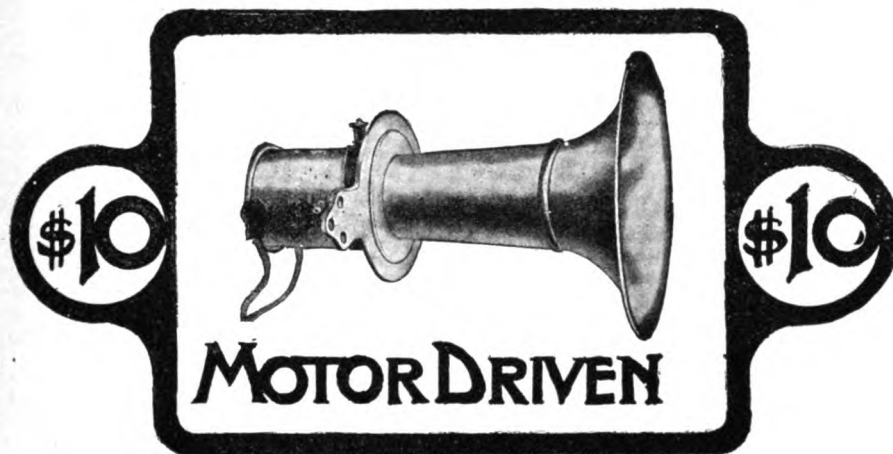
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NEWTONE SUPERIOR

The King of Them All



The latest and most efficient *Motor Driven Signal* on the market today at a popular price.

Newtonone Superior marks an epoch in Electric Warning Signal History. It is a product of skilled workmanship combined with the experience gained by eight years of experimental work to obtain maximum results at a minimum cost.

It is not a *Buzzer* or a cheaply made motor driven horn, but is made of the best material and embodies the best electrical and mechanical construction possible.

Manufactured and guaranteed by the oldest and largest Auto Horn manufacturer in the United States.

PRICE \$10

Specify "Newtonone Superior" for your 1913 equipment

Automobile Supply Manufacturing Co.

220 Taaffe Place

BROOKLYN, N. Y.

Incorporated 1904. Capital \$500,000—fully paid in.

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The easiest oil to sell

Mr. Dealer: Only by offering your customer an oil that makes good, can you build up a steady, profitable oil trade. Panhard Oil helps you. It forces reorders day after day, because it is always of the same high quality.

Panhard Oil is advertised in the leading magazines of the United States. The list includes Saturday Evening Post, Life, Collier's, Review of Reviews, Literary Digest, Motor, Motor Print, Motor Boat, Cycle and Auto Trade Journal, Auto Dealer and Repairer, N. E. Auto Journal.

Why not benefit by this advertising? You'll have a bigger and better oil business. Write for our dealer's "Help-Sell" plan.

PANHARD OIL

The Best Oil to Buy

Mr. Car Owner: The cost of an automobile is considerable. Common business sense calls for care in protecting your investment. By using cheap oil you cannot save over \$5.00 a year. The harm to your engine may be incalculable. Do you think it's worth the risk?

You cannot *see* the difference between cheap oil and good oil. But there is a difference, else we'd be wasting time and money in maintaining Panhard Quality.

Panhard quality is your safeguard. Don't merely ask for "good oil". Say Panhard Oil and *insist* on it. Look for the checkerboard mark on every Panhard package, both cans and barrels.

Write for our booklet, "Motor Lubrication." It helps you judge good oils.

GEORGE A. HAWS

67 Pine Street New York City

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Isn't It Worth a Cent To Stop This Wear?



Are worn-out casings worthless? Are blown-out tires fit for the scrap heap only? Not when you know the Triple Tread.

With that tread-worn tire of yours as a foundation, we can build you a *puncture proof* and *non-skid* casing, which, more likely than not, will give you from 1000 to 2000 miles *more service* than your tire would be good for if *brand new*.

Quick service—guaranteed results—and moderate cost! Sounds too good to be true—but—well, just drop us a postal and get the facts in full. Find out today in what way the Triple Tread actually makes an old tire better than new, and how it

Cuts Chunks from your Tire Bills.

French Chrome leather—tough, water-proof and wear resisting—studded with hardened steel studs on the tread, and flat-headed rivets around the sides—three-ply where the wear is greatest that's the Triple Tread.

This stout, tough, practically wear-proof shield is built onto the worn rubber casing—not riveted on—not laced on—but inseparately united with it by means of our *Steam Heating Vulcanizing Process*, made into one solid, wear-fighting unit, with no patchy-looking outer layers to creep or heat.

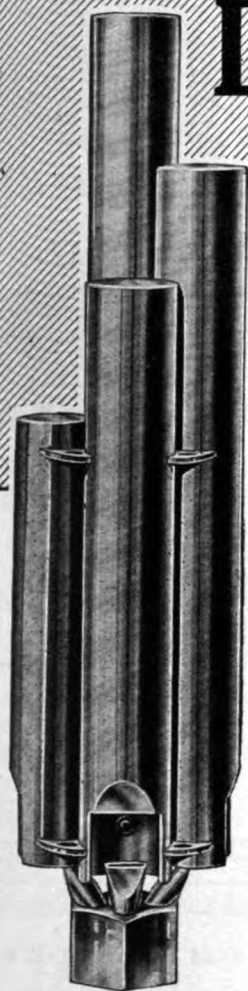
The Triple Tread is a clean-cut success, Mr. Motorist. Will you risk a postal card against our say-so that it's mighty good business to get posted?

TRIPLE TREAD MFG. CO.

1542 Michigan Avenue
CHICAGO, ILL.

Factories: CHICAGO. SAN FRANCISCO, WINNIPEG.





Patented

"The Horn Harmonious"

Dealers: Write for Our Special Offer—One Full-Size Aermore Horn for Demonstrating Purposes, Free

Just send the coupon. Get the facts about our exceptional offer to supply you with a full-sized Aermore Horn for demonstrating purposes, absolutely free.

Aermore is the perfect exhaust horn—the only *self-cleaning* exhaust horn on the market.

It is built on the pipe-organ principle.

It gives a clear, musical, chime-like sound—the blending of four different tones. This melodious chord can be regulated, by the pressure of your foot, to give a soft, gentle warning or a loud, penetrating signal.

The AERMORE Exhaust Horn

will fit any exhaust pipe. It is equally suitable for automobiles, motor trucks, motorcycles and motor-boats. It is economical and easy to install. It requires no upkeep cost.

On account of its unusual construction, it permits no back pressure on the engine—the exhaust passes through freely.

Self-Cleaning—Can't Clog

The Aermore Horn has no reeds or valves. *It cannot clog! It cleans itself automatically.*

Dust, dirt, oil find no resting place in the Aermore.

It is constructed of brass tubing, nickel plated, with solid steel cores and malleable iron fittings. It cannot break or get out of order. Requires no upkeep.

Low Price—Easy Sales

Dealers everywhere find the Aermore a quick and easy seller. On account of its melodious tone and very low price, it is rapidly being adopted as the standard signal.

PRICES—
Aermore 12-in. Horn, \$11 Aermore 15-in. Horn, \$12
Aermore 11-in. Horn, \$10
Aermore Motorcycle Horn, \$7.50

Our Special Offer to Dealers

We have a special offer to make to dealers all over the world—an *extraordinary* offer to supply you with an Aermore Horn for demonstrating purposes absolutely FREE.

The Aermore sells just as soon as it is demonstrated. We know that as soon as you have demonstrated this wonderful signal device you will sell it to your customers.

That's why we make this special offer to you—a full-sized Aermore Horn FREE.

Send the Coupon for Full Information

We can't disclose this special dealer's offer here. So sign and mail the attached coupon and we'll send you full information by return mail.

Dealer's Coupon

Aermore Mfg. Co.
Dept. 5546 1536 Michigan Blvd.
Chicago, U. S. A.

Please send me details about your Special Dealer's Offer of one Aermore Horn FREE.

The Aermore Mfg. Co.

Dept. 5546 1536 Michigan Boulevard, Chicago, U.S.A.

Car Owners: Write for our free booklet and name of your nearest dealer, where you can get a demonstration of the Aermore Horn.

Name.....

Address.....

Jobber's Name.....

Address.....

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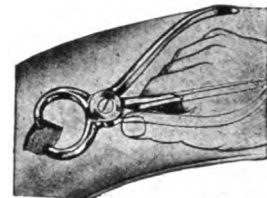
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Whenever you see the word TIRE your first thought is EXPENSE—

But--Think of the Saving GILMER TIRE REPAIR PLIERS

and 5 minutes time each week can accomplish. Isn't it worth while to save 50% of your tire expense?
Over 600,000 Sets of Rubber Gum were used during the past year for repairing small cuts in Automobile Tires. Over 300,000 people used them. The largest part of these were put into the cut by hand—and it's a dirty, disagreeable and unsatisfactory job.

We've never received a complaint on these pliers. However, we decided to make them better—



Old Style—Never a Complaint

HERE THEY ARE.



New Style—

100% Stronger—Ratchet in Handle Holds Them Open.
SAME PRICE. (Patented).

GILMER TIRE REPAIR PLIERS

are filling a long-felt want—you can wear white gloves with no danger of soiling and you NEEDN'T BEND OVER. Consequently, during the next year double the amount of gum will be sold and everybody will be repairing their tires, in order to cut expense.

10,000 Miles of Service are built in every good tire made. Do yours last that long?

If you used the same hap-hazard methods in business which you use in having your car repaired and buying your supplies you would not own a car. Just because you can afford a car is no reason why you should buy two sets of tires to run the distance one set should.

In every instance where a tire blows out a close inspection will show that there is a small cut in the rubber envelope, which allows dirt, grease and dampness to get into the fabric and rot it.

We have a guaranteed proposition which should appeal to you. We want to refer our mail orders to Dealers as soon as possible.

G. WALKER GILMER, Jr., Manufacturer, 52 North 7th Street, PHILADELPHIA, PA., U. S. A.

Every argument for cutting expense is a reason for filling out this blank TO-DAY.

G. WALKER GILMER, Jr.

Gentlemen:—Enclosed please find \$1.00 for which send me one pair of GILMER TIRE REPAIR PLIERS and Cleaner, with a copy of "Tire Insurance."

My Dealer's name is.....

Address.....

This order is placed on a satisfaction guaranteed basis.

Name.....

Address.....

DEALERS—Our discounts are right. Your customers are interested. Fill out this blank and save time.

G. WALKER GILMER, Jr.

Gentlemen:—You may enter my order for and ship cheapest way dozen pair of Pliers and Cleaners, with the understanding, that if, on examination, we are not satisfied with your discount, we are to return at your expense. Please quote us on a basis of a sales output of dozen per year.

Name.....

Address.....

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ANYWHERE
ANY SPEED

**GRAY'S
NEWARK
RELINERS**
TAKE THE WORRY
OUT OF TIRES

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Blow-out Patches, Tube Patches, No-Cement Patches, Cements,
Tire Chalk, Valve Grinding Outfits, Bumpers, Tire
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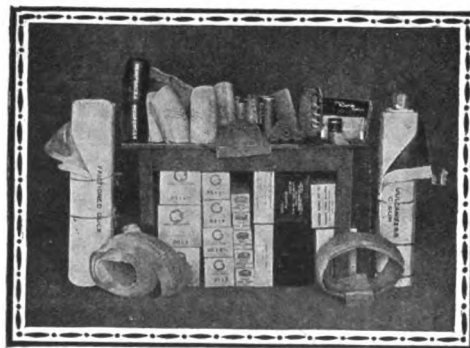
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GRAY SPECIALTY CO., 148 Avon Ave., Newark, N. J.

VOORHEES "IDEAL" AUTOMOBILE RUBBER SPECIALTIES

TO SAVE EXPENSE AND
AVOID TIRE TROUBLES



VOORHEES RUBBER MFG. CO.

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**SOLD UNDER A BROAD GUARANTEE
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PUNCTURE PROOF
Double Tire Mileage and

BLOW-OUT PROOF
Gives Maximum Tire Economy



Ask Your Dealer

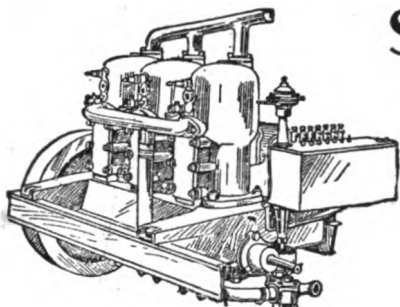
There is a demand in every community for a Tire Re-inforcement that will and does relieve the Dealer and his customer from any chance of a "Come Back."

The "INNERSHU" is in a class by itself and gives a distinct prestige for **QUALITY** and **SERVICE**.

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Grand Rapids, Michigan

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NEW 3-CYLINDER
VALVELESS
2-CYCLE, 5 1/2
INCH BORE
5-INCH STROKE
15 HORSEPOWER
At 600 R. P. M.

\$95

Regular price of these motors is - - - \$350

This is one of our Special Factory Jobs.

**ALSO 4-CYLINDER MOTORS
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—ALSO—

Other Motors, 2 and 4-cycle, all sizes and types, at proportionately low prices. Send for list.

This is without doubt the greatest value ever offered in a motor. They are absolutely new, flawless, and each is equipped with an oiler. These motors are perfectly adapted for use in motor boats, auto trucks, automobiles, pumping stations, and FARM MACHINERY.

We are the "Recognized House of Bargains" for anything in the line of

AUTOMOBILES

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We offer an attractive stock of used cars, all sizes and types. Every one guaranteed in absolutely first-class condition. Do not fail to look over our stock before deciding. Now on our sales floors are Peerless, Packards, Cadillacs, Chalmers, Buicks, Reo, Hupmobile, Hudson, and many other leading makes.

All at Great Reductions.

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TIRES

These tires are all high grade goods. There is no better tire, yet we are in a position to sell them at

35 to 50% less

than regular tire prices. Guarantee optional with purchase. Note prices:—

28x3	\$9.80	34x3 1/4	\$15.75	34x4	\$18.75
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MOTORS 2, 3 & 4-cylinder, both 2 & 4 cycle, \$85 to \$250.
MAGNETOS ALL MAKES, AT 1/2 OF ORIGINAL COST.

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BODIES and **SEATS** at "WRECKING" prices.

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"There is only one remedy. Let me use on them this time the new varnish which is not affected by soapy water, or by road oil and mud,

Valentine's Vanadium Chassis Finishing

Be in a position to make this answer to the car owner who comes to you for advice and a good job.

The ordinary varnish is so quickly destroyed on an automobile that the painter generally gets the blame. Get the friendship of the car owner instead of his ill-will by finishing his car with Valentine's varnishes.

Vanadium Body Varnish for the body.
Vanadium Chassis Finishing for the hood, fenders, and underparts.

Write a line for booklet, "The Care of the Car."

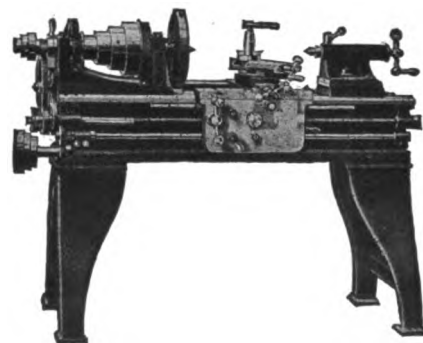
Valentine & Company

Established 1832

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SEBASTIAN 15-INCH LATHE



The LOW-PRICE, PERFECT-QUALITY lathe for the GARAGE and GENERAL REPAIR SHOP.

If you are in the market for a lathe be sure and investigate the merits of the SEBASTIAN.

CATALOG mailed free on request

THE SEBASTIAN LATHE CO.

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CONFIDENCE

in your lubrication is one of the most potent factors of pleasurable motoring. Confidence that every moving part of the car is safeguarded against the destroying effects of friction, makes it well worth your while to use



for the axles, steering knuckles, transmission, differentials and for the various other frictional parts which are fitted with grease cups.

NON-FLUID OIL possesses two distinctive qualities not to be found in other lubricants:

1st—Every atom of its composition is 100 per cent. efficient in reducing friction. It contains none of the solid matter which having no lubricating value eventually congests and destroys bearings lubricated with "filled" greases.

2nd—It *does not melt* under the frictional rubbing of gears or bearings.

Hence **NON-FLUID OIL** offers you the highest efficiency—reduces friction to an irreducible minimum, and lasts much longer than other lubricants because there is no residue to clean out and no loss through melting and leakage.

ASK YOUR DEALER FOR IT

There is so much to say about the comparative value of **NON-FLUID OIL** and about its reputation in the motoring world among car manufacturers and motorists that we have covered the subject in a book called "LUBRICATION OF THE MOTOR CAR." We will gladly furnish you with a copy upon receipt of postal. No other book has such complete information on lubrication. Every frictional part of the car accurately illustrated. It contains a large "LUBRICATING CHART" which is invaluable. Send for it to-day. Just say, "Lubrication Book, New Edition," on a postal.

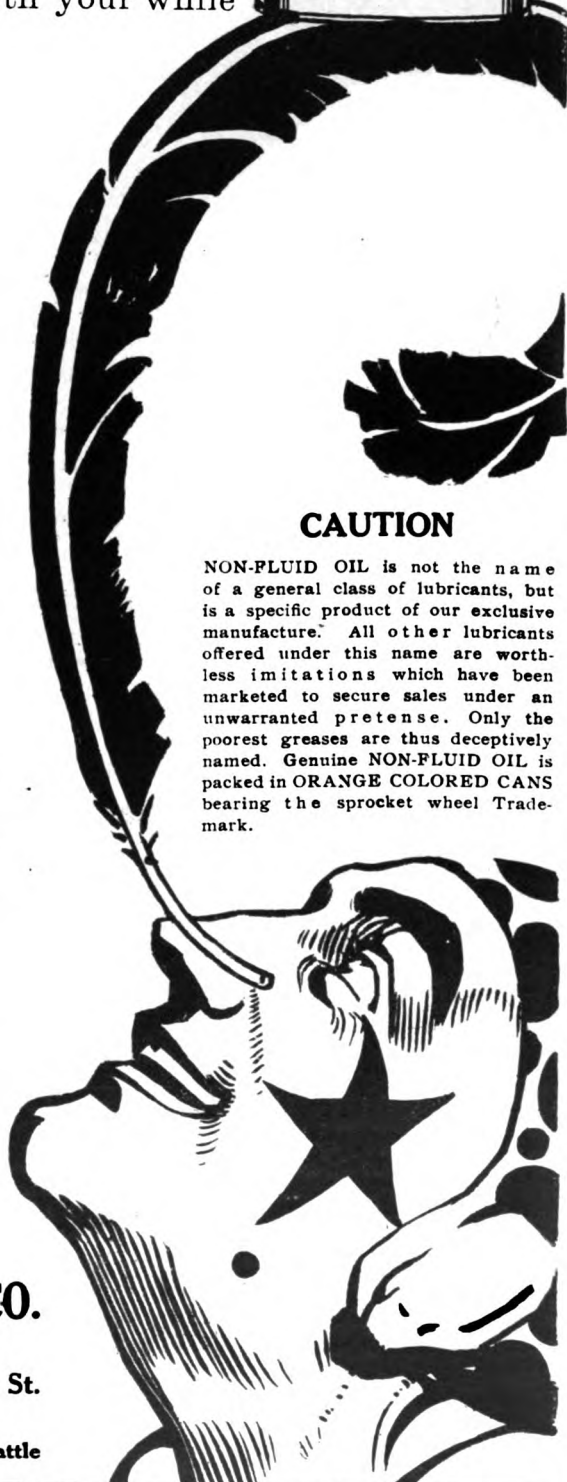
NEW YORK & NEW JERSEY LUBRICANT CO.

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PACIFIC COAST DISTRIBUTORS

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CAUTION

NON-FLUID OIL is not the name of a general class of lubricants, but is a specific product of our exclusive manufacture. All other lubricants offered under this name are worthless imitations which have been marketed to secure sales under an unwarranted pretense. Only the poorest greases are thus deceptively named. Genuine **NON-FLUID OIL** is packed in ORANGE COLORED CANS bearing the sprocket wheel Trade-mark.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

AT LAST
PERFECTED



HERE IT IS!

Model-1913 Protector

Has Taken Six Years to Perfect it!

Highest Grade—Longest Life—Lowest Cost

"Built up" for STRENGTH and DURABILITY

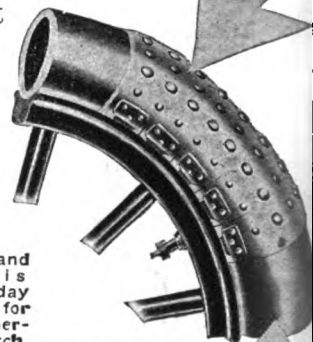
Has been run 14,000 miles with perfect satisfaction

We have been determined to build the best all-round Protector on the market. We now HAVE THE BEST. The PROTECTOR that has LONG been expected—the ONE that ends ALL Tire Troubles under ANY and ALL conditions, is our MODEL 1913 PROTECTOR. Its Construction in brief: Three-ply Special Chrome-tanned Leather with Long, Staple, Sea Island Fabric between plies of leather, on to the center of this we build an extra tread, using the best Imported Swiss Leather obtainable, tanned by a special process for our use exclusively; this tread is studded with our Special Steel Rivet, making it almost indestructible. Sides studded with Spot Rivets to prevent wear and chafing.

Write for Booklet "Tire Sense," and full detail, with latest proposition. We have Special Offer to make in unassigned territory.

20th Century Tire Protector Co.

Main Office and Factory No. 422 Main St., Midlothian, Texas.
Dallas Office, Pacific and Olive Sts., Dallas, Texas.



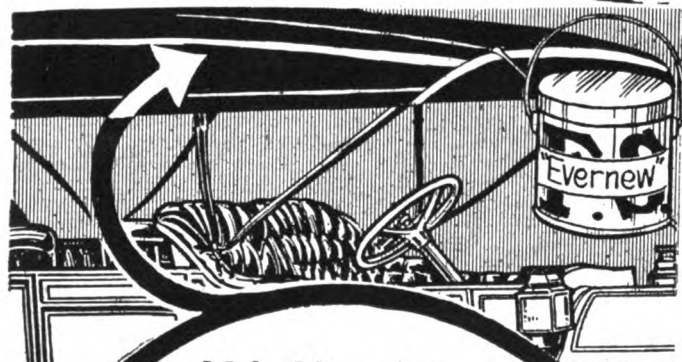
Cut out and send this Coupon today with \$2 for this Emergency Patch.

Give it a thorough trial; if not perfectly satisfactory, return to us, and we will refund your money.

Size of Tire.....

Name

Address



Make Your Auto-
Top Look Like New—Use
Felton-Sibley "EVERNEW"
AUTO-TOP DRESSING

IT'S the best way to brighten it. Easily applied with ordinary paint brush in a few minutes. Water-proof, weather-proof, dries quickly, will not crack, can't injure the finest top. A fine-appearing, new-looking auto-top adds wonderfully to any car—"EVERNEW" Auto-Top Dressing will keep yours that way all the time. Comes in 8 standard colors—special shades to order. Send for color card and prices.

FELTON, SIBLEY & CO., Inc.

Mfrs. Colors, Paints, Varnishes

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PHILADELPHIA, PA.

"Evernew" Auto-Top Sizing for first coat on mohair, cloth or canvas tops that have never been painted.

"Evernew" Auto-Body Enamel in colors to correspond with "Evernew" Auto-Top Dressing.

11

AUTOLINE

TRADE MARK

The Automobile Lubricant that makes for Efficiency in Motoring. Eighty years Oil Making assures it excellence. You can purchase it at most good supply shops—garages—at any of our 14 branches or direct.

Write To-day for the booklet "For your Motor's sake"

WM. C. ROBINSON & SON CO.
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LEE TIRES



Announcing the fact that
Mr. Charles F. U. Kelly and Mr. Harry E. Field
 who have organized the firm of
KELLY-FIELD CO.
 1737 Broadway, New York City
 ARE NOW GENERAL SALES AGENTS FOR
 LEE TIRES, TUBES AND TIRE ACCESSORIES

The members of this firm are favorably known to the trade the country over—

MR. KELLY, the former president and principal organizer of the Kelly-Racine Rubber Co., has been one of the best known tire men ever since bicycle days, having been connected earlier with Hodgman Rubber Co. and B. F. Goodrich Co.

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This makes possible greater sales efficiency and more thorough co-operation with the trade. Added to the proved superiority of Lee Tires (due to the use of better materials and improved processes) and the wonderful record made by the Lee Puncture-Proof Tires on commercial as well as pleasure vehicles—it makes the Lee proposition one that appeals to the live dealer in every community. Write for our special proposition "I."

Lee Tire & Rubber Co.
 CONSHOHOCKEN, PA.



Smiles at Miles

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HESS-BRIGHT Ball Bearings

interchange with most other makes.

Write for the name of the nearest retail distributor.

**THE HESS-BRIGHT
MANUFACTURING COMPANY**
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THE FAMOUS More COMFORT and ECONOMY Miles

With a saver of 40% of gasoline—10% of the car expense—and 20% more speed and power. The ONLY real carburetor adjuster on the market. Do not throw your old carburetor away until you have applied the M. & M. THEN NOTICE RESULTS.

PRICE COMPLETE, \$3.50.

Money refunded in thirty days if not satisfactory. If your dealer does not have the M. & M. in stock, we will sell direct.

BEWARE OF INFRINGEMENTS!

MOLLER BROTHERS CONTROLLER AND ECONOMIZER CO.,
American Office - - - 700 Betz Building,
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Remy Magneto

Exchange your old Magneto for a new Remy

IT will cost practically no more than what you will be forced to pay out for constant repairs on your present ignition system. A new Remy will give your car new life. Write us, or call at any address below and ask for our exchange proposition.

Allowance made for any make of Magneto.

Remy Electric Company, Anderson, Indiana

BRANCHES:—New York, Boston, Detroit, Chicago, Kansas City, San Francisco, Indianapolis.

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The HAGSTROM Rim-Cut Blowout Patch

Positively repairs rim-cuts.

Repairs all blowouts.

Prevents blowouts.

A permanent repair for old casings.

An emergency repair for new casings.

Saves carrying extra casings.

HAGSTROM INSIDE TIRE SLEEVE



BRINGING YOU HOME IS ONLY PART OF THE SERVICE YOU GET OUT OF THE HAGSTROM SLEEVE



THE PATCH REPAIRS BLOWOUTS IF USED IN TIME WHEN RUBBER FABRIC IS FIRST NOTICED. IT WILL PREVENT A BLOW-OUT OR RIM-CUT AND THUS SAVE INNER TUBE.

Write today for gas tank key and latest price list of Hagstrom specialties.

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Distributors (LOWE MOTOR SUPPLIES CO., New York City
WESCO SUPPLY COMPANY, St. Louis, Mo.)

VELVET AUXILIARY SPRINGS

Will make your car ride as soft and easy as a

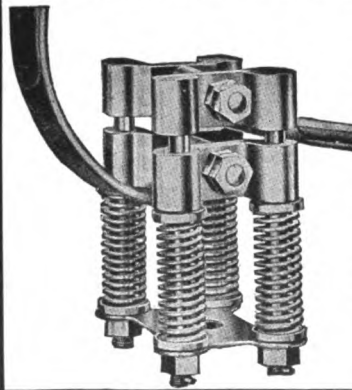
Velvet Cushion

either with light or heavy loads.

You can attach in a few minutes. They allow no side sway. No machine work or special fittings necessary. Strong, durable. Cannot twist out of shape.

WRITE US—Giving name and weight of car; width of rear springs, and size of spring bolts. Sold for cash, on 15 days' trial.

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THE 2-3-2 or 3 A-C-C ENGINES (2 Cycle Three-Cylinder 2 or 3 Port Air-Copper Cooling Engines)

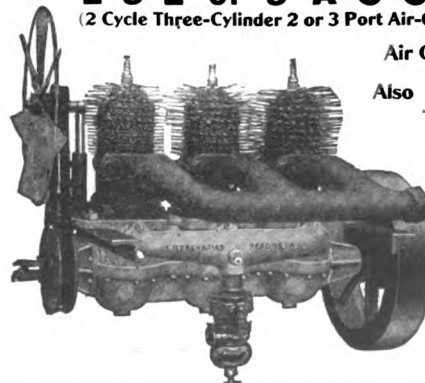
Air Cooled 20-22 H.P.

Also Made in One and Two Cylinders.

Construction is simple, durable, absolutely reliable, and smooth running.

All work thoroughly tested, and perfect satisfaction guaranteed.

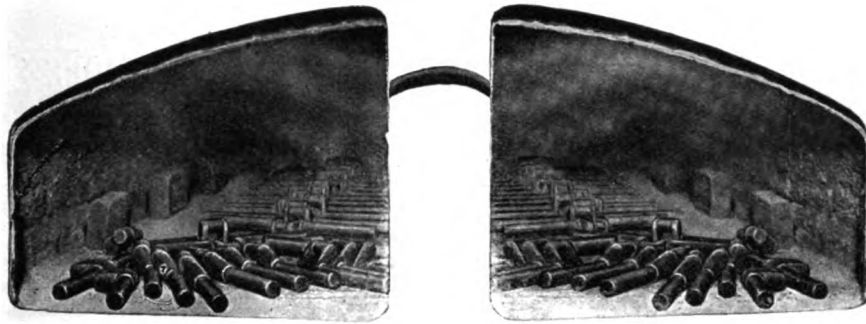
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E. H. ZACHARIAS, - - 121 Washington St., Reading, Pa.

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The Eyes of the Oven!



Looking out from the Heated Compartments of Treating Ovens at 1500° Fahrenheit.

Work wondrously well done requires foresight, constant care and pyrometers.

"Vulcan" Heat-Treatment is the climax of such attention and assures

Superior Drop-forgings

If you are interested in a valuable line of stock

Crank Shafts

Connecting Rods

Valve Stems

Igniter Levers

Rod and Yoke Ends

Mechanics' Auto Tools

Etc.

send for pocket edition (just out) of 1912 Catalogue, or for forgings to order send your blue prints to us for estimate.

J. H. WILLIAMS & CO.

Superior Drop-forgings

No. 17 RICHARDS STREET

BROOKLYN, N. Y.

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Golden Star Auto Body Polish Keeps Your Car Well Groomed

It cleans, polishes and protects the finish.

Does not leave a greasy surface.

Easy and convenient to use.

A few drops of Golden Star Polish used on the dust cloth and your car looks bright, clean and new.



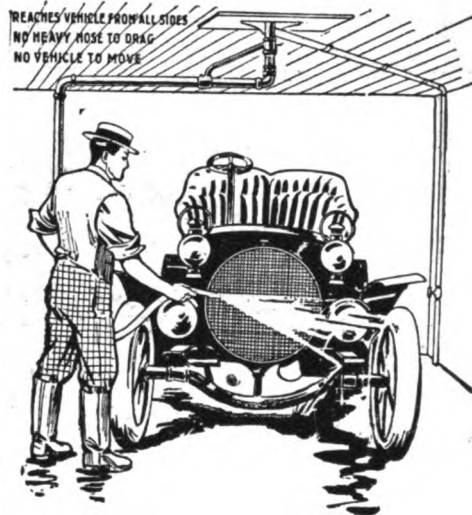
Free Sample

Let us prove (without cost to you) the merits of Golden Star, "The World's Best Cleaner and Polisher." Ask your dealer for a free sample or write us and it will be sent you at once.

DEALERS—Your customers will appreciate good service. Sell them Golden Star Polish. Ask your jobber—he can supply you.

R. W. MORRIS MFG. CO.
Incorporated
Kansas City Missouri

The Western Buggy Washer



IN OPERATION

It saves time, labor and money. It keeps the hose off the floor. It drains both ways. It is made of malleable and wrought iron. It is sold on honor and guaranteed.

THEREFORE, your hose keeps dry and never wears out. No kinks. No freezing. No breaks. Works easily and smoothly.

SPECIAL SALE Price \$8.00

We will ship you one of our Overhead Washers on 30 days trial, if not satisfactory to be returned at our expense. Manufactured under our own patents and guaranteed by us.

The Western Robe Mills
24-26 PECK COURT CHICAGO, ILL.

You Can Save Money

by having broken auto parts repaired by us. Our charge is but a fraction of the cost of a new part. The repaired part is as strong and serviceable as when new.

We repair within twenty-four hours after part reaches our shop—broken cylinders, axle housings, crank and transmission cases (both cast iron and aluminum), etc., and practically all metal parts of the machine.

When Your Auto Breaks Down

Get in touch with us. We guarantee every repair we make. If, within one year from date of repair, part is found unsatisfactory, ship it to us (by freight, collect). Money refunded upon inspection of part.

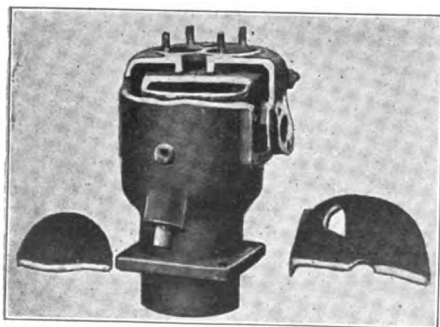


Illustration shows repair made for Axel J. Sjolund, Manchester, Mass. New cylinder costs \$40; our repair charge was \$18.10.

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WATERBURY WELDING CO.

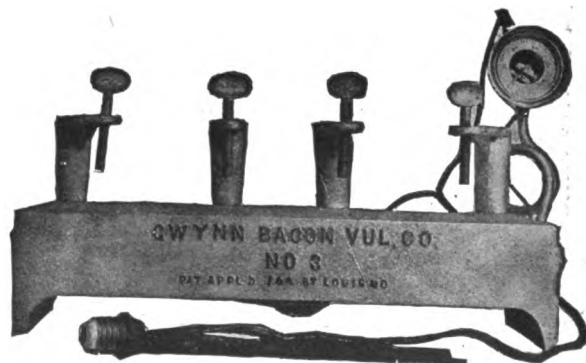
1148 C South Main St.

Waterbury, Conn.

EUREKA

"I have found it"

An AUTOMATIC ELECTRIC STEAM VULCANIZER



The Gwynn-Bacon Automatic Steam Vulcanizer is the only Electrically heated vulcanizer that uses steam, and is automatic in its operation.

Absolutely guaranteed not to burn a tube or require watching.

Written guarantee for one year that it will never cause you any trouble.

Made in three sizes—for the private owner, for the small Garage and for the Garage doing a large business in tube repairing.

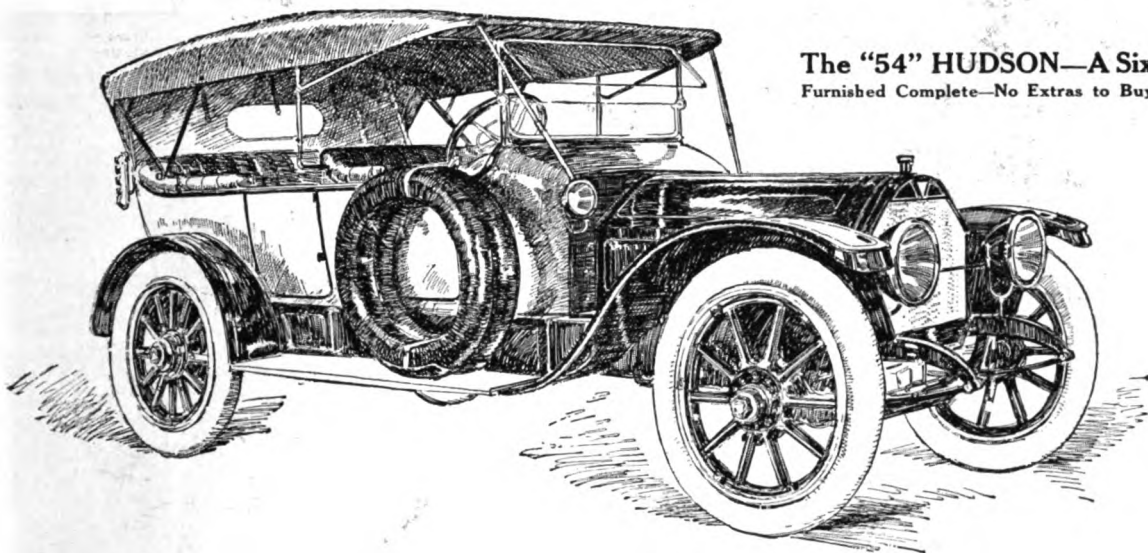
We also make glue pots that have the same Automatic control, that will keep the glue at an even temperature at all times, thereby saving in a year's time several times its initial cost.

Send for Catalogue of prices and terms, with copy of guarantee.

Ask your Dealer or write to

GWYNN-BACON VULCANIZER CO., 1456 Goodfellow Ave., St. Louis, Mo.

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The "54" HUDSON—A Six
Furnished Complete—No Extras to Buy

Here is the Answer

*to that oft asked question: "What will
Howard E. Coffin do when he builds a 'Six'?"*

The "54" HUDSON answers the question everyone in motordom has been asking for years. All know Howard E. Coffin to be America's foremost engineer. His six famous four cylinder cars gained a reputation for him which led all to expect a wonderful six from him.

But sixes are not like fours, as many a designer has learned to his sorrow. Mr. Coffin realized that and so instead of attempting a six alone, he first secured as his associates the men who had already accomplished the most in six cylinder designing. His men came from the leading factories of Europe and America. There are 48 in all—representing 97 leading motor car manufacturers. Combined they know just about all that has been learned in motor car building. So the "54" HUDSON—Mr. Coffin's answer—is the composite of what the most successful builders, working together, have accomplished.

The Best Car They Know

It is smooth and flexible—the qualities for which sixes are really built, and which inexperienced men seem unable to obtain in the sixes they build.

It is powerful—speedy, beautiful, safe and comfortable. Simplicity is a notable feature, and economy in operation is accomplished as it is in but a few cars.

Not Just Two Cylinders Added to a "Four"

Adding two cylinders to a good four won't even make a poor six. Fours and sixes are entirely different.

That is why some sixes give less than 30% increased power when their weight and fuel and oil consumption are 50% greater than the four of same size, to say nothing of the greater first cost.

Comfort—Speed—Completeness

The cushions of the "54" HUDSON are Turkish type—12 inches deep. Backs are high, upholstery thick, springs flexible, and the car is so nicely balanced that it will take the worst roads at speed and with little discomfort to passengers.

On the Indianapolis Speedway, a "54" fully equipped, carrying extra tires and four passengers, did 10 miles at 62 miles an hour. One year ago on the same course a \$500 prize was forfeited because none of many of the best known fours and sixes similarly equipped, driven by famous drivers, were able to do one mile in 60 seconds, flying start.

Every detail of motor car comfort is included in the "54."

It is electrically self-cranks, has electric lights, speedometer, clock, top, rain vision windshield, nickel plated trimmings—21 coats paint and varnish body finish, demountable rims—36x4½ tires, gasoline tank, with magnetic gauge on rear, robe rails, curtains and all the appointments that go with the highest type of car.

The price for either 5 passenger Touring Car, Torpedo or Roadster, is \$2450; 7-passenger Touring Car, \$2600; Coupe, \$2950; Limousine, \$3750—f. o. b. Detroit.

See the Triangle on the Radiator

HUDSON MOTOR CAR COMPANY

7465 Jefferson Ave., Detroit, Mich., U. S. A.

165

Electric Self-Starting—Electrically Lighted

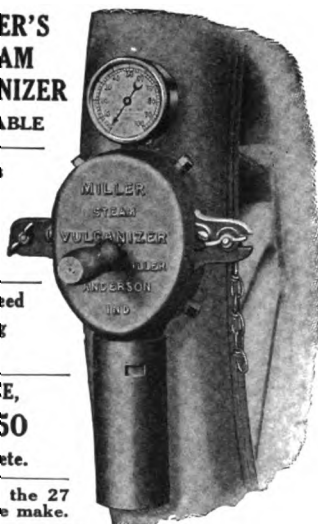
MILLER'S STEAM VULCANIZER PORTABLE

Repairs
Casings
and
Tubes.

Guaranteed
Nothing
Better.

PRICE,
\$7.50
Complete.

One of the 27
kinds we make.



Innerliners in one piece 100 ft. long, 3 or 4 ply, 50c. per lb., less 5% for cash.

MILLER'S TIRE RELINERS—4 PLY ADHESIVE—EXTRA QUALITY

Each	Each
26x2 1/2 inches.....\$1.95	31x4 inches.....\$3.20
28x2 " ".....2.80	32x4 " ".....3.40
30x2 " ".....2.55	33x4 " ".....3.60
32x2 " ".....2.75	34x4 " ".....3.95
29x3 1/2 " ".....2.65	35x4 " ".....4.15
30x3 1/2 " ".....2.80	36x4 " ".....4.30
31x3 1/2 " ".....3.05	40x4 " ".....4.80
32x3 1/2 " ".....3.20	34x4 1/2 " ".....4.45
34x3 1/2 " ".....3.40	35x4 1/2 " ".....4.85
36x3 1/2 " ".....3.95	36x4 1/2 " ".....5.15
30x4 " ".....3.05	36x5 " ".....5.40

MILLER'S TIRE RELINERS—3 PLY ADHESIVE—REGULAR QUALITY

Net Prices—Cash with Order 40 and 5 per cent. off List Prices. Can Furnish Any Size Not Mentioned.

MILLER'S REPAIR MATERIALS

Standard Tread Stock, per lb.....	\$.70
High Grade Tread Stock, per lb.....	.85
Cement Stock for Casings 1 25	
Cement Stock for Tubes... 1.75	
Inside Tube Patching Rubber, cured one side, per lb. 2.00	
No Cement Patches, per dozen packages.....	2 50
No Cement Patching Rubber, sheet form, per lb... 2.00	
Fabric Sea Island Cotton, 17 1/2 ounces, one or two sides.....	1.10
Fabric Common Tire Cloth, 18 ounces, one or two sides.....	.65
Fabric Common Bicycle Tire Cloth, 10 ounces, one or two sides.....	.65
Pure Fine Para Gum, for making acid Cure or Cold Patching Cement.....Net, 2.00	
Miller's Three in One Repair Stock.....	1.20

This stock repairs casings and tubes and makes cement, and eliminates the necessity of carrying a large variety of repair material.

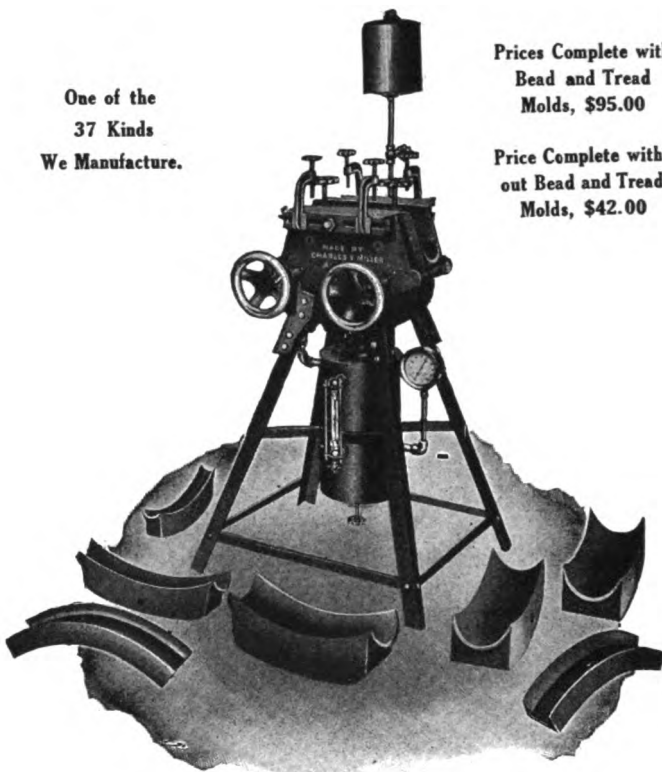
The above prices subject to 5 per cent. discount for cash with order, or in 100 pound lots or over, 10 and 5 per cent.

Write for our 44-page Catalogue, which illustrates large kettle vulcanizers; adjustable sectional vulcanizers; inner tube vulcanizers; inside vulcanizers; retreading vulcanizers; adjustable segment iron cores, tread rollers, power wrapping machines, steam boilers, grinding stands, circular wire brushes, grinding wheels, full line of small rubber tools, tire lasts, automatic steam traps, steam regulators, air bags, gas tubing, auto bumpers, baby carriage tires, inside and outside blow-out boots, no cement patches, repair stocks, hand-made bicycle tires, motor cycle casings and red tubes of extra quality.

MILLER'S IMPROVED ADJUSTABLE, SECTIONAL VULCANIZER

The kind that repairs everything in the Tire line—all sizes of bicycle, motor cycle, auto and aeroplane tires, also 4 to 6 inner tubes at one time. Made and designed by the man who originated and patented the Cavity Vulcanizer, so generally used throughout the world.

One of the
37 Kinds
We Manufacture.



Prices Complete with
Bead and Tread
Molds, \$95.00

Price Complete with-
out Bead and Tread
Molds, \$42.00

**CHAS. E. MILLER. Anderson Rubber Works,
ANDERSON, IND., U. S. A.**

PERFECTION SPRING WINDER



TWO SIZES } Capacity of small size up to 3/32 inch wire. Price \$1.00
Capacity of large size up to 3/16 inch wire. Price 1.50
Special size up to 5/16 inch wire. Price \$3.00

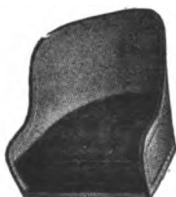
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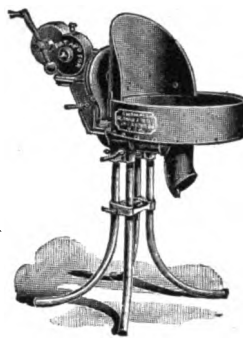
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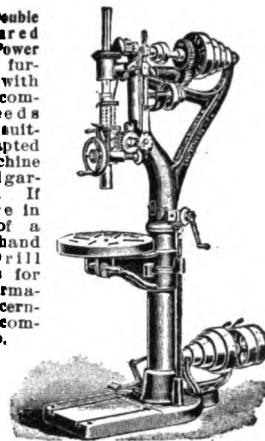
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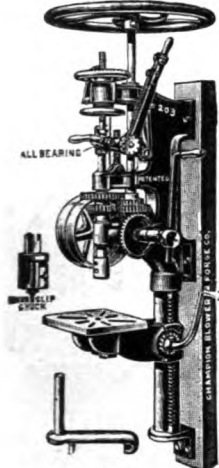


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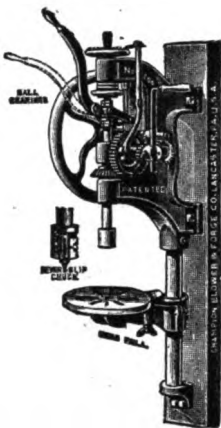


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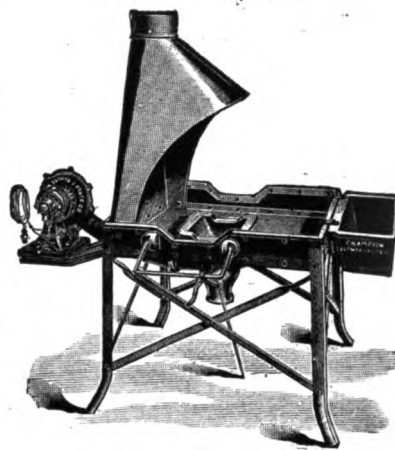
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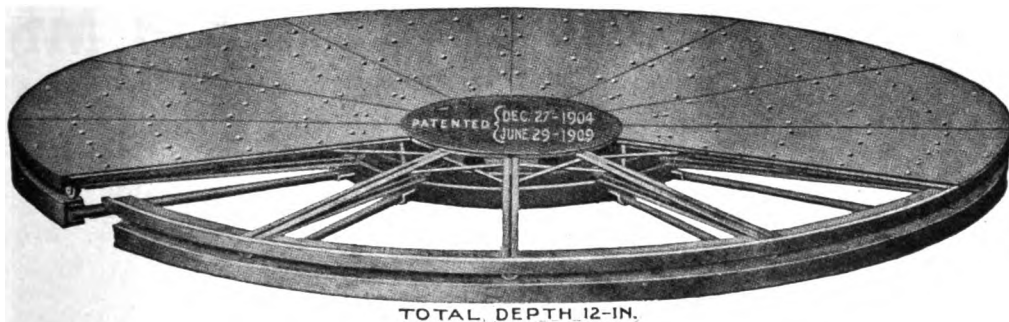
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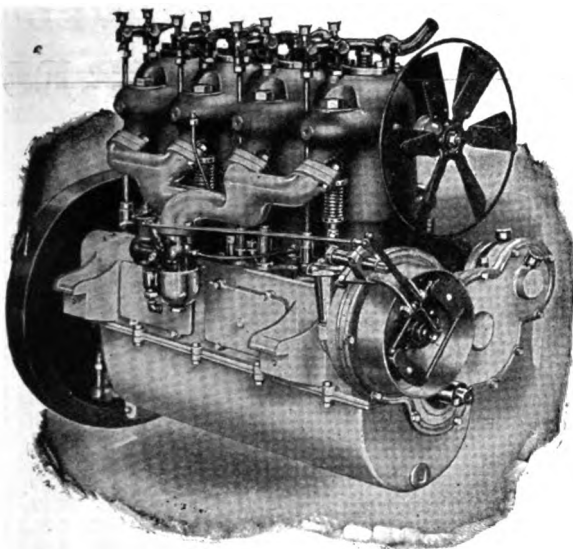
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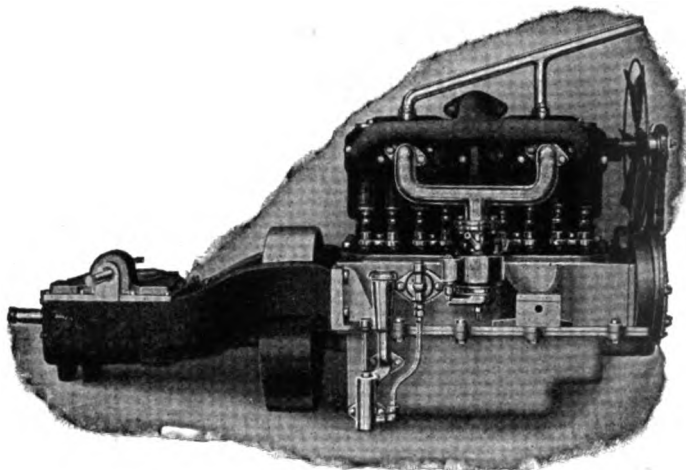
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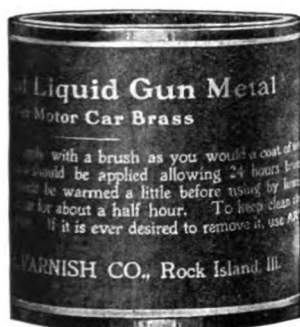
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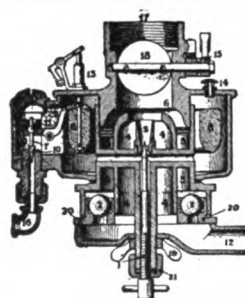


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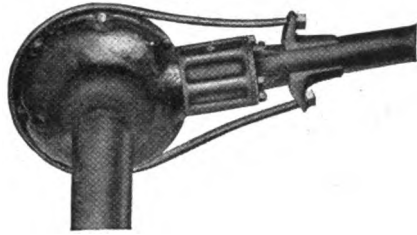
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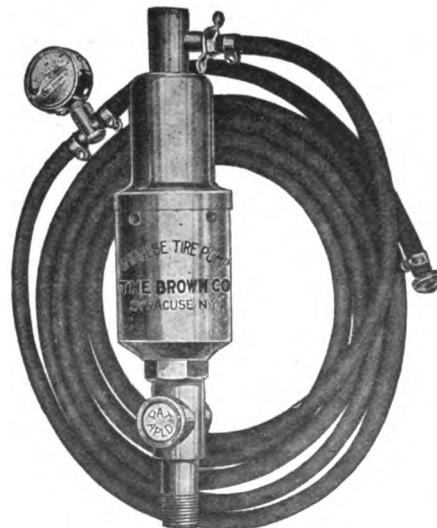
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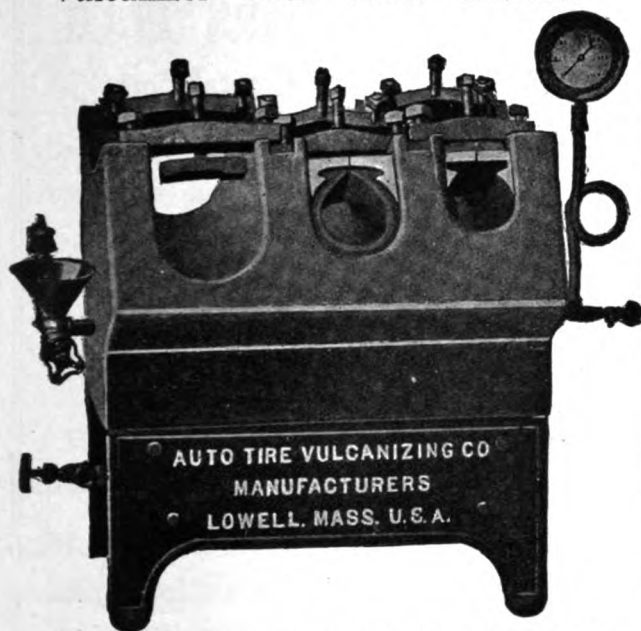
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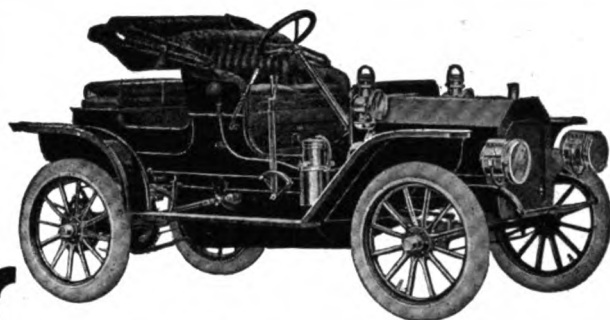
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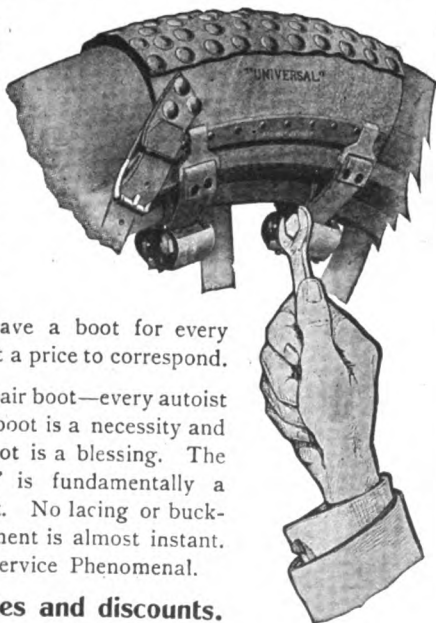
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A HOTTER SPARK, preventing sooty plugs and carbonizing.
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PRICE, \$15.00. Express prepaid if cash accompanies the order.

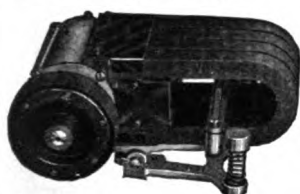
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NO Moving Wires. NO Brushes.
NO Commutator. Runs in Ball Bearings. Starts engine without batteries.



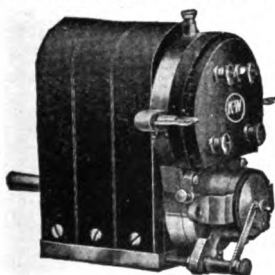
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Single Cylinder.....\$12.00
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4 Cyl., \$50
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Choice of Either Straight Body or Bullet Shaped Lamps.

THE SUCCESSOR TO THE GAS TANK. Current Direct from Magneto.



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The Outfit complete, which is all you need, consists of

- 1 pair complete Head Lamps
- 2 Tungsten bulbs, 2-1/16" in diameter,
- 12 feet wire, all soldered to lamps,
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Instruction Sheet for Wiring.

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The Light which this outfit gives is vastly superior to either a generator or a gas tank.

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For those who want something "extra swell" or "classy" for the touring car, we can furnish, if desired, a 9" bullet shaped lamp which also fits the prop furnished on Ford cars.

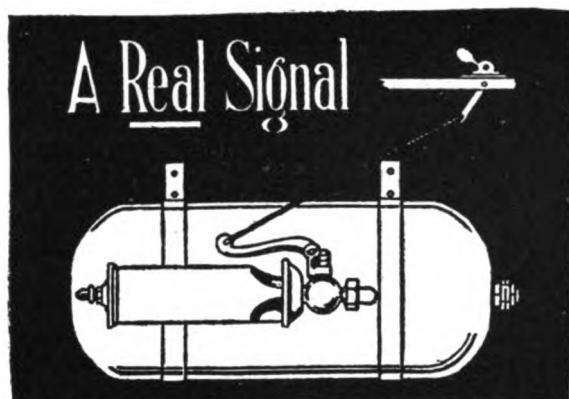
The regular 8" lamp is, however, as large as required to catch all of the rays and throw all of them forward, and a larger lamp than this is merely for looks.

For Black Finishing add \$1.00 to price of either outfit.

WE PAY THE EXPRESS East of the Mississippi River or to the Mississippi on points beyond on any of our goods, when cash accompanies the order.

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We sell the WATRES whistle on a definite guarantee—satisfaction or money back after thirty days' trial.

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1912 STANDARD MAKES.

FREE SPECIAL OFFER FOR THIS MONTH ONLY.

\$3.00 Button Tire Cover given away with every purchase of tires. These tire covers are guaranteed waterproof and dust-proof and will be furnished in any size.

Highest grade stock, comprising of the best manufacturers. Cannot advertise names on account of the reduced prices we are selling them at.

Every tire is guaranteed brand new, perfect in every respect, and are not more than six months old. Some of these have the names of the makers on and others are buffed.

We thoroughly examine and test every tire and tube under heavy pressure to detect any weakness before shipping.

These are not the kind usually advertised. Nothing but the best stock is quoted in this ad.

Casings to fit Clinchers, Quick Detachable or Dunlop Straight Side Tires.

Size	Casing	Tube	Size	Casing	Tube
28x3	\$9.50	\$2.50	35x4	\$22.00	\$5.95
30x3	10.75	2.75	36x4	19.50	5.40
32x3	10.50	3.00	37x4	23.50	5.75
28x3½	12.00	3.00	32x4½	20.00	5.50
29x3½	14.50	3.15	33x4½	23.00	5.60
30x3½	14.50	3.75	34x4½	23.50	5.75
31x3½	15.00	3.75	35x4½	24.50	6.00
32x3½	15.00	3.90	36x4½	25.00	6.10
34x3½	15.75	4.15	37x4½	25.00	6.20
36x3½	15.00	4.25	34x5	20.00	6.00
30x4	16.50	4.60	35x5	25.50	6.25
31x4	17.00	4.75	36x5	26.00	6.50
32x4	17.50	4.90	37x5	28.00	6.75
33x4	19.00	5.00	37x5½	30.00	7.00
34x4	19.50	5.10			

Take advantage of these prices and free offer, as we cannot guarantee how long these prices will stand good.

We guarantee these tires and tubes to be strictly 1911 and 1912 goods.

We are one of the oldest and largest tire mail order houses in the United States, and you do not have to hesitate to send us an order with cash accompanied, as we can refer you to any Commercial Agency or Bank in New York, as to our references.

We agree to refund your money if goods are found unsatisfactory upon receipt.

We Ship Goods Subject to Examination.

INSIDE TIRE PROTECTORS.



Prevent blow-outs, punctures, and greatly increase mileage. These tire protectors are made from 3 to 6 ply of Egyptian fabric, with a self-seal flap reinforcing the rim and sides, always the weakest parts. Tube pinches are eliminated by the use of these protectors.

Order a complete set of them and save 100% on your tire expense.

Size	Reg. Price	Cut Price	Size	Reg. Price	Cut Price
28x2½	\$4.65	\$2.40	35x4	\$7.00	\$4.90
28x3	4.75	2.60	36x4	7.75	5.00
30x3	4.90	2.35	32x4½	7.25	5.00
30x3½	5.25	3.35	34x4½	7.50	5.10
32x3½	5.50	3.55	35x4½	7.60	5.25
34x3½	5.75	3.95	36x4½	8.00	5.50
30x4	6.20	3.75	34x5	8.10	5.60
31x4	6.25	4.00	35x5	8.25	5.75
32x4	6.40	4.20	36x5	8.50	6.00
33x4	6.60	4.40	37x5	9.00	6.50
34x4	6.75	4.75	37x5½	9.25	6.75

Owing to the fact that our profits are very small, we sell for cash only, and under no circumstances otherwise.

C. O. D. orders filled if 10% is accompanied with order, to show good faith.

Send for complete list.

EXCELSIOR TIRE CO.,

1777 Broadway,

New York City, N. Y.



J.&B.

MASTER VIBRATOR

**DELIVERS
A FAT HOT SPARK
AT THE RIGHT TIME**

Will insure that the charge in each cylinder will be fired when the pistons are in the same relative position in the cylinders.

Uniform Ignition

prevents your engine from having that disagreeable pounding.

Insures More Power and a Smooth Running Engine

Just one adjustment to make. You wear but one set of platinum points instead of four sets, and the one set should last you as long or longer than the four, for it has 25 per cent of iridium.

Can be used in connection with any make of vibrating spark coil. Makes the coil doubly efficient.

Your engine will deliver 10 to 15 per cent more power, and in exceptional cases this may amount to 25 per cent.

Write immediately for descriptive circular including the price.

J. & B. MFG. CO.
Pittsfield, - - - - - Mass.

J-M NON-BURN BRAKE LINING

**Proves Its Efficiency
Under Severe Tests**

NEW YORK SCHOOL OF AUTOMOBILE
ENGINEERS, INC., 146 WEST 56TH STREET.

NEW YORK, January 18, 1910.

H. W. Johns-Manville Co.,
New York City.

Gentlemen:-

About three months ago, we equipped one of our Locomobile cars with J-M Non-Burn Brake Lining, using it on both rear wheel brakes, transmission brake, and as a clutch lining.

The service given has been perfectly satisfactory, especially the transmission brake, which always gave us trouble on account of excessive oil and grease, which find their way onto this brake lining. J-M Non-Burn is evidently oil and grease proof. As a clutch lining, it has also given excellent satisfaction, and we intend equipping our other cars with it.

In view of the fact that our cars, particularly the brake and clutches, are put to the severest test while giving our students driving practice, we cannot but remark that J-M Non-Burn is without doubt the most efficient and satisfactory brake lining with which we have come in contact.

Very truly yours,
(Signed) E. W. CAMERON.

Why don't you try J-M Non-Burn? Sold by most dealers. If your dealer hasn't it, order from our nearest branch. Sample and Booklet sent on request.

H. W. JOHNS-MANVILLE CO.

Manufacturers of Asbestos
And Magnesite Products

ASBESTOS

Asbestos Roofings, Pack-
ings, Electrical Supplies, etc.

Albany
Baltimore
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Los Angeles

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New York
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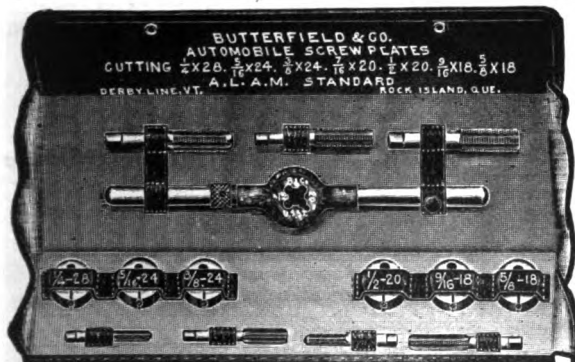
**"Everybody's Doing It Now."
Doing What?**

WHY BUYING ONE OF OUR NEW

AUTO SCREW PLATES

IN A

Genuine Leather Roll.



This is the Ideal Set for the Autoist.

Don't fail to place your order now.

BUTTERFIELD & CO.

DERBY LINE, VT.

ROCK ISLAND, CAN.

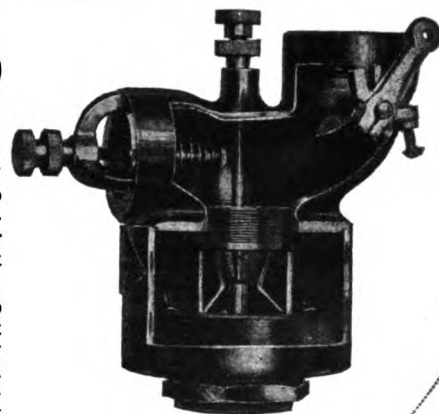
New York Store, 126 Chambers St.

**TRY IT FREE FOR 30 DAYS
ON YOUR CAR**

THE MACO

Carburetor

SEND NO MONEY.



We only want you to try it for 30 days without any obligation or expense on your part to purchase.

You don't have to take our word for it that the MACO will show greater efficiency and economy than the carburetor you are now using—test it out yourself. Its efficiency at all speeds; its greater economy; its ease in starting will readily convince you that the MACO is superior to any carburetor on the market. There's no tubes to clog up, no floats to stick, no complicated working parts to wear or catch. The utter simplicity of the MACO, both in construction and operation, is what makes it such a success.

We will allow you 33 1/3 Discount from our list price.

We will send you a MACO carburetor for thirty days' trial. If, at the end of that period, you are satisfied, send us our list price, or if you will send us your old carburetor, we will allow you one-third off our list price for same.

To secure benefit of this remarkable offer use this coupon

LIST PRICES range from
\$9.00 to \$14.00, according to size

**MOTOR APPLIANCE CO.
OF AMERICA**

74 Warren St., New York, N. Y.

Motor
Appliance
Co. of Am.
74 Warren St.,
New York City.

Dear Sirs: Kindly
send me a MACO
Carburetor for thirty
days' trial on my car as
per your above offer.

Make of old carburetor.....

.....Type.....Size.....

Make of car.....

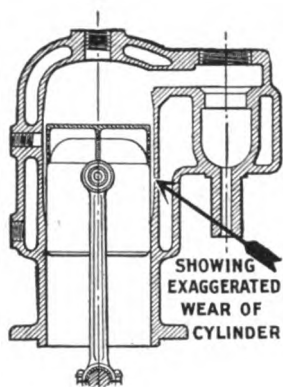
Model.....H. P.....

Name.....

Address.....

Town and State.....

GOOD WORK IS TALKED ABOUT



That is why we have had so many automobile cylinders to re-bore. One owner, satisfied with our work, brings another.

Every motorist wants his car to be powerful and quiet running. Don't you?

When a cylinder wears large in diameter (as it is bound to do in time) oil, fuel and power are extravagantly wasted.

The piston will slap and the engine become noisy. It takes but a few thousandths of an inch of wear before your motor is reduced from a powerful, quiet mechanism to a weak, inefficient source of power.

The Underwood method of reboring cylinders is the one process you can depend on for accuracy and the restoration of original conditions of a high grade motor.

The cylinders are rebored accurately on special machines and new pistons and rings are fitted with the skill and experience that long practice has made possible. The results of our process are equal to securing a new motor at a fraction of the cost.

We guarantee our workmanship and material to be first-class, so you need have no hesitancy in regard to our ability. We have rebored a host of cylinders without one failure.

Start the cylinders and an old piston (for a sample) in our direction **now**.

H. B. UNDERWOOD & CO.

Established 1870

1019 Hamilton Street

PHILADELPHIA

LOXON LAMP GUARD

THE KEY TO SAFETY



PROTECT YOUR INCANDESCENT LAMPS

Unprotected lamps around a garage or building where oils, waste or inflammable materials are used, are mighty dangerous. Don't take a chance. Equip your lamps with Loxons. They cost little and save much. Absolutely prevent Breakage, Fire, Explosion and Lamp Theft. They lock on with a key.

Sample Postpaid, 25 cents.

MCGILL MFG. CO.
88 Oak St. Valparaiso, Ind.

AUTOMOBILE

Bodies, Chassis,
Wheels, Steer-

ing Devices, front and rear Axles, Steel
Rims, etc.

GET OUR PRICES AT ONCE.

BORBEIN AUTO CO.



2109-2111 N. 9th Street,
ST. LOUIS, MO.



GUARANTEED to
Repair cuts in shoes
or punctures in tubes
without heat or vul-
canizing.

Ask your jobber.

SET, \$1.50

CHAS. O. TINGLEY & CO.
RAHWAY, N. J.



"STAR" LATHES

9 in., 11 in., 13 in. SWING.

Suitable for fine accurate work
in the garage, repair shop, tool-
room and machine shop.

Send for Catalog B.

THE SENECA FALLS MFG CO.

429 Water Street, SENECA FALLS, N. Y.

The right Forge for your Garage— The Buffalo "Down Draft" No. 660

With this forge, the smoke and gases are mechanically removed through the down draft hood, keeping the shop clean and smokeless. Powerful blast furnished by hand or electric blower. Will heat the heaviest iron in a few minutes.

Ask for complete description,
No. 144 BT.



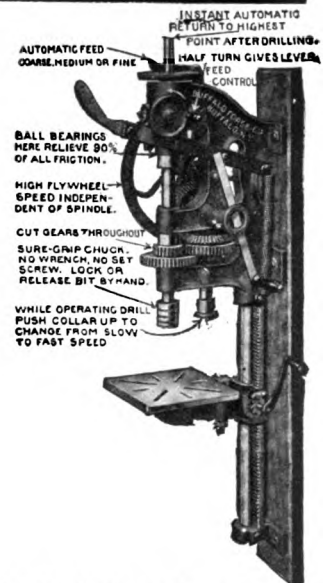
No. 660
Size of Hearth, 28x40 inches

Forge No. 131, shown to the left, is the most popular little repair forge made. Geared hand blower. Cast iron bowl. Strongly braced legs.

Buffalo Forge Co., Buffalo, N. Y.



No. 131



Buffalo Ball Bearing Drill No. 94 A

Drills any hole up to 1½-inch diameter to center of 21-inch circle. Furnished with tight and loose pulley for power, and can also be operated by hand. The proper drill for a garage. Modern, strong, easy running.

Other drills in booklet No. 119 BT, sent on request.

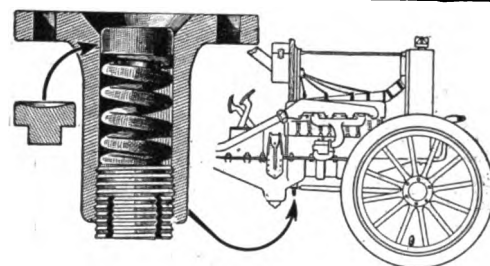
SPLITDORF

MAGNETO

"Always There"

SPLITDORF ELECTRICAL CO.
98 Warren Street Newark, N. J.

BRANCHES:
NEW YORK CHICAGO SAN FRANCISCO
BOSTON DETROIT LOS ANGELES
PHILADELPHIA KANSAS CITY SEATTLE
LONDON BUENOS AYRES



Special
for
Model T
Ford
Owners

Does Your Front Axle Radius Rod Rattle?

Send for circular of our New Anti-Rattling Spring Ball Socket, which will prevent this and ensure your axle radius rod against breakage.

ATLANTIC MACHINE COMPANY

MANUFACTURERS OF VERTICAL TIMER BRACKETS

963 Atlantic Ave.

BROOKLYN, N. Y.

Packard

CABLE

IS THE PUBLIC'S CHOICE FOR
Lasting Ignition and Lighting Service

Why? "Ask any user."

Want new 2-color circular?

THE PACKARD ELECTRIC COMPANY

229 Dana Avenue, Warren, Ohio.

DOVER AUTO FUNNELS

ARE THE STANDARD

56 Sizes and Styles



SEND FOR 1912 CATALOGUE.

DOVER STAMPING AND MFG. CO.
CAMBRIDGE, MASS.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

REGULATE THE CARBURETION AS YOU DRIVE ALONG

Haven't you often wished while driving your motor car that you might "feel" of the mixture in some way, in order that you could be sure whether or not it might be improved?

THE MICHENER GASOLINE SAVER AND PRIMER

enables you to literally "feel" of the mixture and to determine instantly the correct mixture, by means of the hand control as you drive along.

DON'T LET THIS STATEMENT GO UNCHALLENGED OR UNPROVEN

The Michener Gasoline Saver and Primer positively saves gasoline; increases the speed of the engine on the same amount of gasoline; enables you to regulate the carburetion for all load, speed and atmospheric conditions as you drive along, by means of the hand control; is an infallible primer.

If, after 30 days' trial, you are not absolutely convinced of these facts, return it and your money will be immediately refunded.

Here are a few more testimonials. (These letters are all on file in my office.)

CONTINENTAL.

Wheaton, Ill., Apr. 8, 1912.

E. S. Michener,

New Castle, Pa.

Dear Sir: I ordered your auxiliary air valve and primer through the Central Garage of this city. I have given it a good trial and am highly pleased with the results. It makes my Schebler Carburetor adjustable from the seat, which is a big advantage.

DR. ARTHUR B. CONNOR.

MITCHELL.

Bridgeport, Conn.,

July 10, 1912.

E. S. Michener,

New Castle, Pa.

Dear Sir: I placed your Gasoline Saver and Primer on my 1911 Mitchell Roadster with the understanding that if same did not prove as represented by your agent here it would be removed and my money refunded. It gives me pleasure to state that "Gasoline Saver" is a true name. The first day I made 92 miles on 5 gallons of gasoline. The previous mileage was about 9 to 11 miles per gallon.

I am very truly yours,

GEORGE H. LEE.

THOMAS.

Chicago, Ill., July 3, 1912.

E. S. Michener,

New Castle, Pa.

Dear Sir: By the use of your gas economizer I have increased the mileage from 7.40 to 11.23 miles per gallon, which is better than you advertise it to do. I am well pleased with it.

Respectfully yours,

DR. MARSHALL D. EWELL,

155 North Clark St.

Metrology and Microscopy.

RAMBLER.

Pittsburgh, Pa., May 21, 1912.

E. S. Michener,

New Castle, Pa.

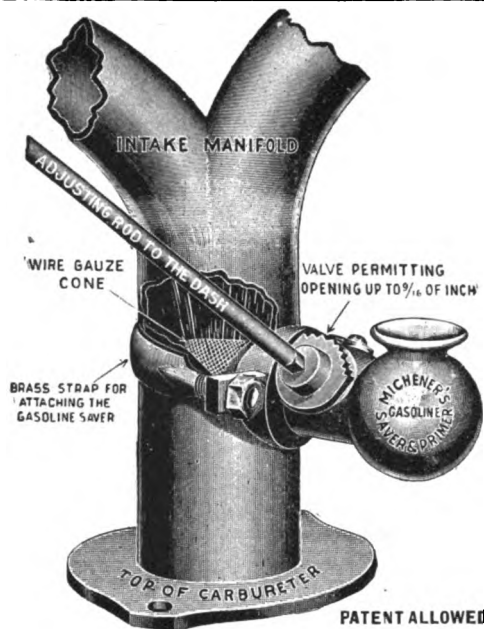
Dear Sir: The Michener Gasoline Saver which I purchased from you last February has proven very satisfactory. I have tried it out thoroughly on a Rambler Cross Country car and it does more than you claim for it. You should call it Gasoline Saver and Power Producer. It is just what is needed to get the adjustment while running on the road. I believe it increases the power 15 per cent., besides saving the gasoline and keeping the engine cool.

Very truly yours,

L. G. MARTIN.

Rambler Pittsburgh Dealer.

Let me send you booklet and further information



PATENT ALLOWED

MAXWELL.

New Albany, Ind.,

July 18, 1912.

E. S. Michener,

New Castle, Pa.

Dear Sir: The writer tested your Gasoline Saver device very thoroughly before we sold any and found it is all you claim for it in saving gasoline.

On a run of 83 miles that we made the average was 16 1/2 miles to the gallon, and previous to this the very best we could do was 9 miles to the gallon.

Yours very truly,

F. KAHLER, Jr.
Secy. The Kahler Co., Mfg.
Automobile Bodies.

REO.

Browning, Mo., July 24, 1912.

E. S. Michener,

New Castle, Pa.

Dear Sir: The Gasoline Saver installed on my Reo car certainly does save gasoline for me. I think you have a good device and I advise my friends to equip their cars with it.

Yours truly,

JAS. P. BOLLING.
Dealer in Horses and Cattle.

WINTON.

Battle Creek, Mich., July 24, 1912.

E. S. Michener,

New Castle, Pa.

Dear Sir: I installed one of your Gasoline Savers on a Winton Six today and find it very satisfactory.

Respectfully,

F. PAUL COUNTS.

CADILLAC.

Steelton, Pa., May 3, 1912.

E. S. Michener,

New Castle, Pa.

Dear Sir: I have had your Gasoline Saver on my four-cylinder Cadillac touring car for several months and it is giving surprising results. Besides saving gasoline it causes the engine to run smoother and develop more power. The longer I use it the better I like it.

Very truly yours,

A. R. CALDER.

COLE 40.

Buffalo, N. Y., June 13, 1912.

E. S. Michener,

New Castle, Pa.

Dear Sir: I have increased the mileage of my Cole 40 from 10 to 12 miles per gallon to 15 to 17 miles per gallon by the use of your device, and feel very much satisfied with the results.

S. PIEK.

Niagara, Lockport & Ontario
Power Co.

E. S. MICHENER, 800 WASHINGTON ST., NEW CASTLE, PA.

FORD T.

Washington, D. C., May 6, 1912.

E. S. Michener,

New Castle, Pa.

Dear Sir: I have used your Gasoline Saver and Primer on my Ford T with fine success. I have driven this car about 15,000 miles and am therefore familiar with it. The Gasoline Saver was attached one month ago, and I find that it improved the running of my engine, gives more power on the same or less gas and is fine for priming the motor.

Yours truly,

A. C. SHANNON.
Mgr. Loose-Wiles Biscuit Co.

BUICK.

Bridgeport, Conn., July 26, 1912.

E. S. Michener,

New Castle, Pa.

Dear Sir: The Michener Gasoline Saver was placed on my Model 28 Buick early in the spring and would not be without same, as it gives perfect carburetion under all conditions. Cooler running motor and little or no carbon. I obtain about 20 miles per gallon. Heretofore about 12 miles. For a gasoline saver I personally can recommend same. Very truly yours,

DR. D. B. HAWLEY.

MAXWELL.

Willow Grove, Del., July 3, 1912.

E. S. Michener,

New Castle, Pa.

Dear Sir: On a 36 H. P. Maxwell at a speed of 15 miles per hour, by admitting the proper amount of air through your Gasoline Saver device, we gain up to 22 miles per hour. This extra increase of speed is from the use of your device, without giving any extra gas to the motor whatever.

Yours very truly,

H. H. SMITH & BRO.
Dealers in Gas Engines.

MARION.

Lebanon, Pa., April 2, 1912.

E. S. Michener,

New Castle, Pa.

Dear Sir: The Michener Gasoline Saver and Primer which I have installed on my Marion Bob Cat Roadster does all and more than you claim for it. I have driven motor cars since 1902, but never have I seen any device so simple in construction work such phenomenal results. It will pay for itself in gasoline saved in one month.

Very truly,

CLARENCE S. WEIMER,
Sec'y Weimer Machine Wks. Co.



Raincoats \$4.00 to \$20.00; Capes and Dusters, \$2.00. Liberal discount to dealers. Ask to see our DOUBLE TEXTURE Guaranteed Raincoats at \$5.00 each. Insist on our label.

Climatic Raincoat Company, Inc.,
102 Fifth Ave., N. Y.



THE STAR SPEEDOMETER

is a well built mechanical Speed Indicator and Odometer. Its daily work and accuracy will please you. Send for booklet.

STAR SPEEDOMETER CO. Milton, Pa.



Gardner Garage Pump

Don't say you can't afford a GARAGE PUMP until you get our catalog and

SPECIAL PROPOSITION

Write today

THE GARDNER GOVERNOR CO.
Station R, Quincy, Ill.

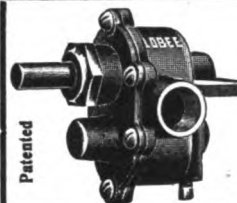
VANGUARD BALL BEARING WIND SHIELD

Absolutely Automatic.

This shield operates with more ease than any other.

Write for discounts to

Vanguard Mfg. Co., Dept. "G," Joliet, Ill.



If you want Good Circulation on your Automobile, Launch or Motor Boat use a

LOBEE PUMP

Write for Booklet A.

LOBEE PUMP

& MACHINERY CO.

Buffalo, N. Y.

FORE-DOORS.

Bring your open-front car up-to-date. We make fore-doors to fit all standard makes of automobiles.

Write for prices and description.

AUTO SPECIALTY MFG CO.,
326-30 E. Market Street, Indianapolis, Ind.

Get This Sure Protection Against Car Robbers

The Watch Dog Lock

PATENT APPLIED FOR.

Price \$2.00. Write at once for Descriptive Circular.

S. BREAKSTONE

1712 Michigan Ave. Chicago, Ill.



"PERFECT" VEHICLE WASHERS

save labor, water and hose.

CATALOGUE

PERFECT MFG. CO.

ALBANY, N. Y.



COMPRESSED AIR OUTFITS

LEAST WEAR AND CARE
G.S. Comstock, Mechanicsburg, Pa.

A "Reservoir" Grease Pump

Storage Can and Grease Gun Combined

The can is a galvanized steel tank, 8 inches in diameter and 18 inches high, that will hold 25 lbs. of grease. Attached to the side is a specially constructed, double acting, long stroke brass pump, that draws the grease from the can and delivers through a five foot flexible metal oil tight hose or nozzle, with a swivel tip, that will reach anywhere.

There is a cover to keep out dirt, a handle to carry about by, and a foot rest to steady it when in use; all enameled in two colors, with polished brass trimmings.

The pump will handle any of the light greases, or non-fluid oils, such as are in general use in transmissions and differentials.



THE OLD WAY



Saves Time and is Clean

Charging a gear box by the repeated filling and emptying of the old style small grease gun is a tedious operation and a dirty one.

The Delta Reservoir Grease Pump does away with all that; it saves time and you don't come in contact with the grease at all.

THE NEW WAY



FREE DELIVERY OFFER

If your dealer does not have it, remit the price direct to us and we will deliver at your nearest express office, all transportation charges prepaid. This applies anywhere in the U. S. excepting Alaska.

PRICE, \$15.00 EACH

DELTA MFG. CO., Bloomfield, N. J.

Illustrated Descriptive Circular on Request.

Write for
free booklet
"Automobile
Ignition."
See below.



Sectional View.
Note the secondary
combustion chamber
within the bullet-
shaped nose.

The Plug For Winter Use

The same feature that makes Sharp Sparks the best for Summer use makes them incomparable in Winter. The secondary combustion chamber (see illustration) is an exclusive feature of

SHARP SPARK PLUGS

The spark across the gap in the bullet-shaped nose of this plug explodes the gas in the secondary combustion chamber, which in turn fires the gas in the cylinder. The gas in this enclosed chamber is always heated above the temperature of the gas in the rest of the cylinder and is the last to cool when the engine is at rest. As a result the Sharp Spark Plug, more than any other plug on the market, helps you to avoid the nuisance of long cranking and bothersome priming.

Give them a Trial this Fall

By taking advantage of our four months' free trial offer, you can give Sharp Sparks a thorough test under all conditions of service at our expense. Your money is refunded if you are not absolutely satisfied. Sharp Sparks are guaranteed for one year.

Free Booklet "Automobile Ignition"

Contains a complete guide for locating and remedying ignition troubles and a full description of the construction and self-cleaning qualities of this plug. Pocket size. Use the coupon below.

The Sharp Spark Plug Co.

3378 Broadview Road

Cleveland, Ohio

Mail this coupon
today.

Please send me your booklet
"AUTOMOBILE IGNITION."
Name.....
Address.....
City.....
State.....

Mr. Automobilist!

Your tire maker is very anxious to impress upon you the importance of

TIRES INFLATED TO THE RIGHT PRESSURE.

He insists that this is tire economy and
SAVES YOU MONEY.

How do you know what pressure you have in your tires?

A Schrader Universal

(Trade Mark Registered in U. S. Patent Office)



HALF SIZE.

(Patented March, 1898—Other Patents Pending)

Tire Pressure Gauge

will tell the exact pressure in your tires at any time, day or night, by simply holding this Gauge to your Valve for a second. Its recording sleeve remains in place, showing the exact pressure in the tire, so that the Gauge can be taken anywhere and read at night, to the front of the car into the light of the lamps. After the pressure has been ascertained the Indicating Sleeve can be pushed back into the Gauge with your finger. No catches or snaps to operate or get out of order. This Gauge is 2 1/4 inches long over all, short enough to apply easily to the smallest diameter of wheel, and can easily be carried in the vest pocket or the change pocket of your trousers.

PRICE \$1.00 EACH, Ready for Delivery Now
GUARANTEED SIMPLE AND ABSOLUTELY ACCURATE

Can be obtained from all tire manufacturers
and the dealers, or

A. SCHRADER'S SON, Inc.,
28-32 Rose Street, New York City



**"THE ORIGINAL CLOSED
END PLUG"**

WHAT THEY DO

Ortonville, Minn., July 10, 1912.

Your "Best" plugs are giving better service than anything we have ever used heretofore in our car. Plugs have never been out for any cause whatever.

Their principal value to us is the regular firing of all four cylinders whether on high or low speed. We do not think anybody could make a mistake in using "Best" plugs.

ORVILLE ELEVATOR & MILLING CO.

Endorsed by more than 40,000 Motorists

CORRESPONDENCE INVITED IF YOU CANNOT
OBTAIN THEM FROM YOUR DEALER

Send for Booklet "R," "Spark Plug Information."

THE BEST IGNITION EQUIPMENT CO.
200 West 64th Street, New York.

IRVIN SILVERBERG & CO.,
541 Van Ness Avenue, San Francisco, Cal.,
Pacific Coast Agents.

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Automobile Dealer and Repairer

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THE NEW YORK
PUBLIC LIBRARY

VOL. XIII, No. 7.

NEW YORK, SEPTEMBER, 1912.

548723

ASTOR, LENOX AND
TILDEN FOUNDATION

PRICE 10c. PER COPY
\$1.00 PER YEAR

ELECTRIC VEHICLES CONTINUED.

The Series Wound Electric Motor As Used In Street Cars and the Motor Speed.

No. 2

BY SYDNEY F. WALKER.

It will perhaps be as well to give a short explanation of the construction and properties of the series wound electric motor, the form that is almost universally employed for street car driving, and the method of controlling the speed by varying the connections to the field magnets, is a modification of the method of controlling the speed of street cars. The electric motor consists of a drum, built up of a number of soft iron, or mild steel plates, insulated from each other by varnish, and strung together on to a brass boss, which is itself keyed on the steel shaft upon which the whole apparatus revolves. The discs, before they are strung upon the brass boss, have rectangular pieces punched out of their edges, at regular intervals around them; and when the discs are assembled, these punchings together form continuous slots, lying longitudinally on the face of the drum. The slots are insulated electrically, and insulated wires are laid in them, arranged in a certain way, and of a size sufficient to carry the largest current the motor will be called upon to accommodate, without undue heating. If heating occurs, the insulation will be damaged, and the motor will develop less power, and may be practically destroyed. This matter will be dealt with later on in this article. The wires upon the drum are wound in sections, and adjacent sections are connected to segments of another drum called the commutator, which is also carried upon a sleeve, that in its turn is keyed to the steel axle.

The commutator is built up of copper segments, insulated from each other by strips of mica, and insulated from the sleeve which carries it, by collars of micanite, a substance made from small pieces of mica, and shellac, compressed into the collar form under hydraulic pressure. The sections of the wire upon the drum, or the armature, as it is called, are connected to the segments of the commutator in such a manner that when current is delivered to the commutator, it will pass through the coils upon the armature, in such a direction, that when current is also passing round the coils of the field magnets, the armature will move in the direction required. The armature revolves within a cylindrical space formed by the pole pieces of what are termed the field magnets. The office of the field magnets is to create a magnetic field within the space in which the armature revolves, of a certain strength, such that when the pressure and current for which the motor are constructed is delivered to its terminals, the magnetic field created in the space in which the armature revolves, and the magnetic field created by the currents passing in the armature, together cause revolution of the armature, at the speed

determined, and so as to furnish the power for which the machine has been designed.

In the modern electric motor, the field magnets are carried on the inside of an iron or steel cylinder. They consist of masses of iron, sometimes of thin iron plates, sometimes solid, which are welded to the ring at the back, and carry what are practically horns, in front, the horns of the pole pieces together forming the cylindrical space in which the armature revolves. Insulated wires are coiled round the cores, as they are termed, of the field magnets, and in the case of the series wound motor, as usually connected, the same current which passes through the armature coils, also passes round the field magnet coils. A magnetic field is created in the space in which the armature revolves, which is directly in proportion to the strength of the current passing through the field magnet coils. Figs. 1 and 2 are sectional diagrams of a typical electric motor.

The current is delivered to the motor by what are called "brushes," which bear upon the commutator segments. The term "brush" is used, because in the early machines, the Gramme and the Siemens, brushes formed of bunches of tinned copper wire were employed for the purpose. In the modern motor, blocks of carbon are nearly always employed, as the wear in the commutator is less, and the carbon itself has a certain amount of lubricating value. Further, providing that the size of the carbon brushes is properly proportioned, the effect of the sparking which always takes place to a greater or less extent, between the brushes and the commutator segments, has less deleterious effect than with copper.

When the series wound motor is connected in the usual manner, the current passes from the positive terminal of the motor through the armature to the opposite brush, thence round the field coils to the negative terminal of the motor. As will be explained, the field magnet coils are connected in parallel for the purpose of controlling the speed of the motor, and then the current which has passed through the armature, or that is on its way to the armature, divides between the two halves of the field coils. This means that the current in the field coils and the strength of the magnetic field created, is practically halved.

In the modern motor there are now often more than two field magnet poles; and there are sometimes more than two sets of brushes. When there are four sets of brushes, those opposite to each other are connected together, the current passing to the commutator through the two positive sets of brushes simultaneously, and emerging from the two negative sets of brushes simultaneously. Figs. 1 and 2 are sectional diagrams of a four pole motor.

Back Pressure of the Motor.

Another matter that had better be explained, is the back pressure created in the motor, by the revolution of its armature, an important and valuable property. The principle upon which the dynamo electric ma-

chine is constructed is, it will be remembered, that whenever a conductor or a number of conductors are moved through a magnetic field, so as to cut the lines of magnetic force, an electrical pressure is created in the moving conductors. This leads in the case of the electric generator, to the pressure which is sent out to furnish light or power, or whatever the current may be used for. In the case of the electric motor, it leads to the curious result, that the armature of the motor, as it revolves, creates an opposing pressure to that of the supply service; and it leads to the further curious result, that the actual working pressure, the pressure which is driving current through the coils of the armature and field magnet, is only a small portion of the total pressure delivered to the motor. With the ordinary working pressure employed with electrical vehicles for instance, 80 to 88 volts, the actual pressure

electric generator, demands that the resistance offered by its coils should be as low as possible. Every machine takes a certain toll of the power delivered to it, for its own use; the proportion which it hands over to the useful office for which it is employed being known as efficiency. In the case of an electric motor the charge made by the motor coils for performing the work, of converting electrical into mechanical energy, is measured by the product of the square of the current strength, multiplied by the electrical resistance. In the hypothetical case given above, the charge made by the coils would be about 1-3 h.p.* This is not the whole charge made by the machine for the conversion of electrical into mechanical energy. Charges are made for the friction created by the bearings by the air friction created by the revolving armature, by the heat lost in the sparks at the brushes when it occurs

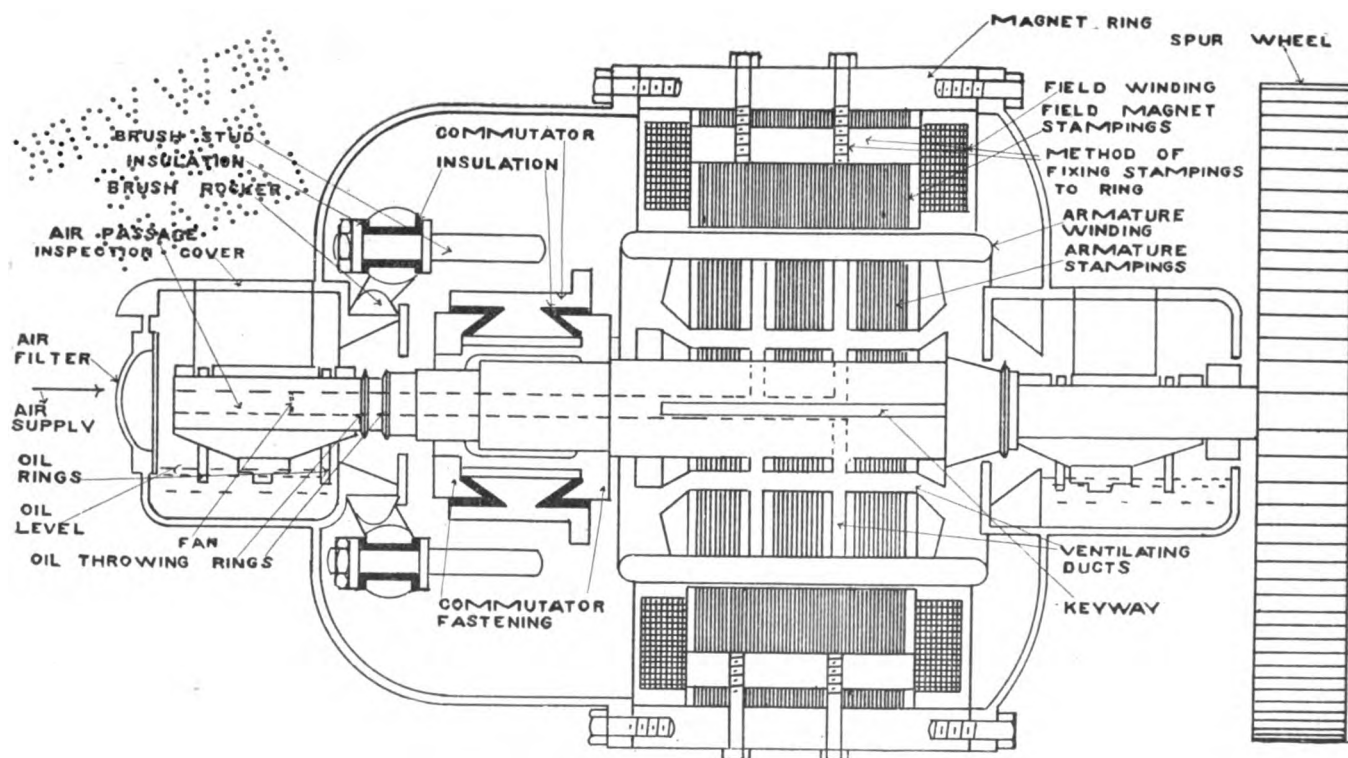


Fig. 1.—Longitudinal section of an electric motor, showing construction of armature, field magnets, etc.

driving current through the armature coils may be only a few volts. The energy absorbed by the motor is the product of the pressure delivered at its terminals, multiplied by the current passing through its coils but the current passing through its coils depends upon the difference between the impressed pressure, the pressure delivered by the source of current, the accumulator in this case, and the opposing pressure, the back pressure created by the revolution of the armature of the motor itself. With a pressure, for instance, of 80 volts delivered by the accumulator at the terminals of the motor, and say with a current of 50 amperes passing through the motor coils, the motor will be absorbing electrical energy equal to about 3 I-3 h.p. If the back pressure is 75 volts, the actual working pressure driving current through the armature and field magnet coils, is only 5 volts.

The matter perhaps will be better understood when it is mentioned that the electrical resistance of the armature and field coils of electric motors, is always very low. In the hypothetical case taken, the combined resistance of the two would be only 0.1 of an ohm. The efficiency of any electric motor and of any

and by the heat that is created in the iron cores of the armature. All of these have to be made as low as possible in order that the motor shall be as efficient as possible; but the above will show how important it is that the resistance of the armature and field magnet coils should be as low as possible. With the combined resistance of the two sets of coils only 0.1, it will be seen that only a very small pressure is needed to drive the necessary current through the coils to perform the work.

Self-Government of the Electric Motor.

The creation of the back pressure referred to above by the revolution of the armature of the electric motor, leads to another very important property; viz., its capacity for self-government. It will be understood that as the pressure required to drive the current through the field and armature coils is so small, and as it depends upon the difference between the back pressure and the received pressure, any increase or decrease in the speed at which the armature is revolving will decrease or increase the working pressure, and thereby decrease or increase the current passing through the armature and field coils. In prac-

tice, this leads to an increased load, causing a slight decrease of speed, and the immediate passage through the coils of the increased current required to deal with the increased load; and on the other hand, a decreased load leads to a slightly increased speed, and cuts off the current which is now no longer required, owing to the decrease of the load.

Factors Governing the Speed.

It will be seen from the above, that the speed of the vehicle is controlled entirely by the speed of the motor; not as in the case of the gasoline motor car, by varying the gear wheels interposed between the motor and the driving wheels of the car. Further, it will be seen, that there are several factors governing the speed, some of which are under the control of the driver, and others that are not under his control. In the first place the pressure of the accumulator cells, as already pointed out, commences to fall from the moment the charge ceases. With the lead accumulator cell at any rate, whether it is working or not, immediately the charging current is switched off, the pressure commences to fall. The fall is considerable at first, owing to the dissipation of the gases mentioned above, which create the additional opposing pressure, necessitating the additional charging pressure; but after they have got completely away, and after the battery has settled down to what may be termed its normal pressure, it continues still to fall, whether working or not. It falls more rapidly when current is taken from it, and naturally it falls more quickly, the greater the current strength that is passing through it. Large demands for current, for instance, during a short hill climb, will lower the pressure of the battery very much more quickly than a comparatively long run on the level, when the current taken is smaller.

Further, the pressure delivered at the terminals of the motor decreases with an increase of current quite independently of the fall of pressure due to the working of the cell. All electrical resistance makes a charge upon the initial pressure for the passage of current through it, and the charge is strictly proportional to the strength of the current and the resistance through which it is passing. The law is expressed thus: $E = C \times R$; where E is the fall of pressure in volts, or parts of a volt, through the resistance R ; C is the current strength in amperes; and R is the resistance in ohms or fractions of an ohm. The resistance of the individual cells of an accumulator is measured in small fractions of an ohm; nevertheless when there are a large number of cells, say 40 or 44, and a large current is passing out to the motor, say during hill climbing, the charge made upon the initial pressure furnished at that moment by the accumulator may be sufficient to appreciably affect the current passing through the motor. It must be remembered that a difference of 1 volt, or even half a volt, makes an appreciable difference in the current passing through the motor coils. This is one reason why a resistance is inserted in the circuit between the accumulator and the motor; in order that a portion of it may be cut out when the pressure of the accumulator cells falls, either from the time they have been working, or from the momentary passage of a powerful current say during hill climbing.

The self-governing properties of the electric motor have been referred to in the foregoing, and they are very valuable. For instance, when the vehicle commences a hill climb, the motor automatically slows up, as it does with any increased load, and automatic-

ally demands an increased current from the accumulator. From what has been stated, it will be understood that the demand of increased current from the accumulator tends to lower the pressure delivered by the accumulator at the motor terminals, partly by reason of the charge made for the passage of the larger current through the cells, and partly by the effect of the large demand upon the working of the accumulators themselves; the lowering effect of the large demand upon the pressure. In running an electrically driven vehicle therefore, all of these requirements have to be provided for; viz.: the lowering of the battery pressure due to its working, the lowering of its pressure during the passage of powerful currents, as during hill climbing; and the changes in the amount of power demanded from the motor, and therefore from the accumulator, at starting, during hill climb-

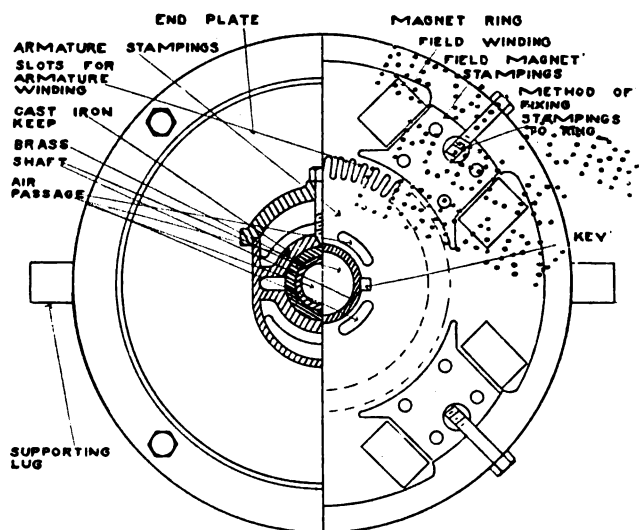


Fig. 2.—Cross Sections of a Four Pole Electric Motor.

ing, going over rough roads, and when running on smooth level roads.

The problem is met in the two ways; by dividing the battery itself into two halves, connecting the two halves together in parallel, and adding resistance, which can be cut out at will; then connecting the two halves of the battery in series, adding resistance, and cutting it out at will; and by leaving the battery connections always the same, all the cells connected in series, and connecting the two halves of the field magnets in parallel, inserting a resistance in series between the accumulator and the motor, which can be cut out at will; and connecting the field magnets in series, with a resistance between the motor and the accumulator, which again can be cut out at will.

In addition, the field magnet coils may be shunted as it is termed, they may be bridged across by a coil of wire, a resistance which forms another path for the current that would pass through the field magnet coils and so reduces the current passing through them. It may be mentioned that where, as is preferred by some inventors, two motors are employed, one geared to each wheel, the two motors may be connected in series and in parallel, in the same manner as has been described for connecting the two halves of the field magnets in series and in parallel.

(To be continued.)

If your engine suddenly ceases to converse, and becomes absorbed in thought, test your battery wires before going after the long distance cranking record

OLD TIRES FOR COVERS.

Increasing Service in this Way is Beset With Some Difficulties.

BY JAMES F. HOBART, M. E.

The writer has been requested to look into the matter of doubling up tires on automobile wheels by placing one worn-out tire outside another, upon the forward wheels particularly, thus obtaining from 500 to 1,000 miles extra wear from tires which otherwise would be thrown away.

Different methods have been adopted for this pur-

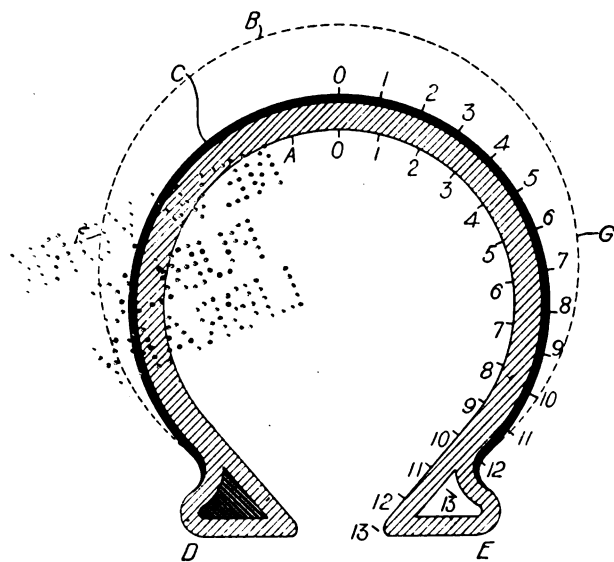


Fig. 1.—Outer Tire or Casing.

pose, but the writer is not able to give the actual experience of any car driver who has tested out the matter by actual practice, therefore the object of this story will be to find out what is practical in the matter of doubling up outer casings on the front wheels.

First, let's see what happens when one casing is pulled on over another. Fig. 1 represents the section of an outer tire or casing, which is about 4 inches in diameter and about $2\frac{1}{2}$ inches across the clinch beads, on the flat, D to E.

The thickness of the tire is approximately $\frac{3}{4}$ inch from A to B, and after the tread has been worn down, it is about $\frac{1}{4}$ inch from A to C. On the sides of the tire, at F and G, the thickness varies greatly according to the wear the tires have been subjected to. Country worn tires, used entirely upon good roads, will usually be found thicker at F, G, than at other places, while those tires which have been run among railroad tracks and other side-wearing things, will be, as shown by Fig. 1, nearly of the same thickness in all places.

Be the wear as it may, the portion of the tire remaining, has much to do with the doubling up of tires, for if there be $\frac{1}{4}$ inch of tread left, it goes without saying that the tube which is pulled on over another tube will not reach as far toward the rim of the wheel as when the tire (inside one) is thinner. In the drawing shown by Fig. 1, which was made to scale, it was found by careful measuring that the shoe used outside would reach around far enough to hit against the bead of the inside shoe or tire.

The points, 1, 2, 3, etc., upon outer and inner tires, illustrate this matter. Starting in the middle of the tread, the inside of the tire was stepped around with a pair of dividers set less than one-half inch. The steps

are marked, and run up to 13, as shown. Then, the outside of the worn tire was stepped around, upon the line C, and the thirteenth step landed in the middle of the bead as shown. Therefore, should another tire, exactly like the one shown by Fig. 1, be pulled over the tire in question, it would reach around far enough to lap the rim opposite the clincher beads. The more tread left on the shoe, the less will the outside shoe reach around the inside one, probably ending just at the edge of the rim when not badly worn on the sides at F and G.

It is understood, of course, that the regular tire has been deflated before the attempt is made to pull the second tire on over it. It is also necessary that tires be used without wire in the beads, for a pretty sorry job would probably be made in trying to pull over such a tire. It may be possible to do so, but the writer is "from Missouri" as regards the wire beaded outer tire for doubling as above described.

The next thing to consider is what happens lengthwise of the tire, that is, around the circumference of the tire already on the rim. Assume that the diameter of the tire across the flat portion, from A to H, Fig. 2, is 34 inches, and the diameter of the work shoe, across C, I, is $34\frac{1}{2}$ inches, the respective circumferences would differ $3.141 \times .5 = 1.5705$ inches, just about 1 9-16 inches.

The above amount being the difference in diameter (if the tread is worn less, the difference will be more) between the outside and inside of the shoe or tire tread respectively, it is very plain that if the smaller

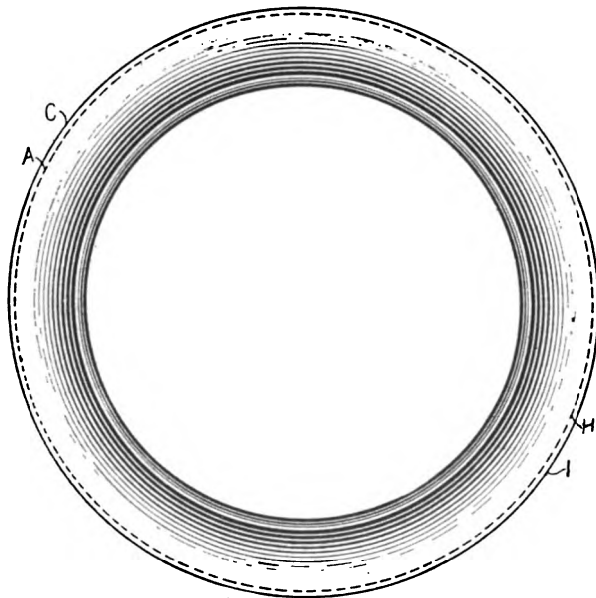


Fig. 2.—Circumferential Tire Shrinkage.

circumference be forced on over the larger diameter, that either the outer shoe must stretch, or the inside one must contract the stated distance before they can touch each other.

Possibly there may be a slight stretching of the outside tire tread, but that is exceedingly doubtful indeed. What probably happens is the shortening of the inside shoe to the extent of 1 9-16 inch, and as the outer tire cannot stretch appreciably, it must not be expected that the inner tire will shrink, therefore the only course open for the different circumferences to adjust themselves, is for the inner tread to lie away from the outer one around a portion of the circumference.

This must necessarily result in a corrugating of the

outer surface or tread of the inner tire, while the tread of the outer tire is distended to its utmost, thereby placing a severe strain upon that tire. The beads of the outer tire are also pressed outward into a larger diameter than intended for them, and this means a greater strain than ever to tear the tire through the beads—a strain which probably will prove more than the beads can stand unless they are wire-reinforced, which, as previously shown, may interfere prohibitively with the placing of wire-reinforced tires outside of other worn tires as desired.

The shortening of the circumference of the tire on a

as if a tire could stand the work without some reinforcing or holding of the beads, it is now in order to see what can be done in that direction. It may be found that the beads will stand all the strain put upon them by the doubling-up process, without anything to reinforce the beads, but as stated, this is a very doubtful matter, and, should it be found that the outer tires are perfectly self-supporting, and are in no danger of tearing out the beads of the outside tire. Should this be found the case, there is still the dirt and mud catching and slinging tendency of the loose rims, to be taken into account.

It will probably be found necessary to support the beads of the outside tire in some manner, and we will next cast about for the various methods by which this may be done. Fig. 5 illustrates one way by which the outside tire may be securely held in place but this method demands the making of special segments for use in cases of this kind.

The inside tire is shown at N, N, Fig. 5, the outside tire at O, O, while the metal rim of the wheel is visible at P. The special segments are indicated by Q, Q, and as shown, are thin aluminum plates, pressed into shape or cast if found desirable, to fit the bead of the outside tire and at the same time, clear the spokes of the wheel, also to avoid the air-tubes, and any bolts or pins which may be used to prevent creeping of the tire around the rim of the wheel.

As further shown, the opposite segments are fastened together by bolts of the ordinary kind, or machine screws, fitted with nuts may be employed. In fact, the ordinary "stove bolts" may be used for this

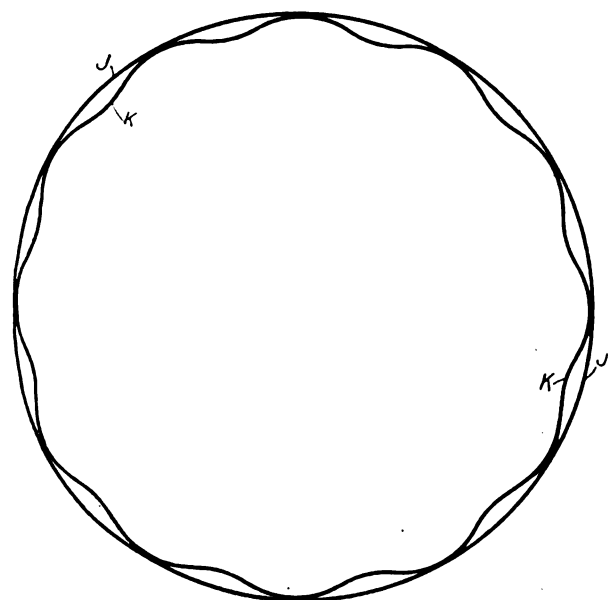


Fig. 3.—Probable Position of Inner Tire.

wheel, to the extent of 1 9-16 inches, is a pretty serious matter, and could the inside tire be seen when it is inflated, with the second tire outside, it would probably resemble a narrow and very coarse piece of wash-board fastened around the rim of a pulley.

Fig. 3 shows what is the probable position or condition of the inside tire after doubling with another tire of the same size, and after inflating the inside tire. Whether or not it will be found desirable to operate a wheel with the tire in the condition shown at K, K, must be determined by actual trial. It does not look good to me, but like a singed cat, it may be "a whole lot better than it looks."

In Fig. 3, J, J, represents the inner diameter of the outer tire, and K, K, represents the outside diameter of the inner tire. The inner of the out, and the outer of the in.

But to come back to old tires again. The lay-out shown by Fig. 3, may work out, but we will anxiously await for the gentleman from Missouri to show us.

To make sure about the position of the tire beads, on either side of the wheel, the writer procured a piece of 4-inch tire, cut out a couple of short sections and placed them together as shown by Fig. 4. The section L, L, was placed upon a piece of paper and marked around, very carefully with a pencil, then the other section, M, M, was carefully put in place and also marked around. Thus the engraving shows the exact appearance of a couple of discarded tires after having been doubled-up as described. A scale is engraved by means of which the exact dimensions of the tire sections may be read off.

It is evident that the lay-out shown by Fig. 1, is accurate, and that the tire beads do lap just about as shown by marks 13, on Fig. 1. As it does not seem

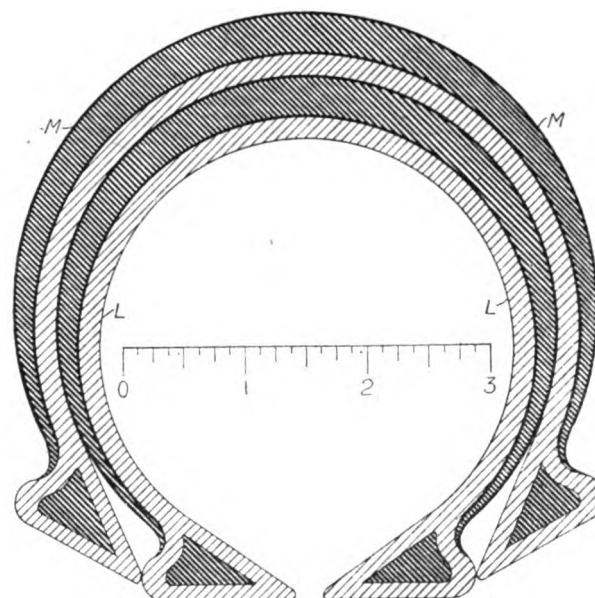


Fig. 4.—Real Sections from Worn Tire.

purpose. The metal segments, Q, Q, may be made in a variety of ways and still meet the requirements of the work.

The holding clips, Q, Q, may be made either in single bolt segments, or they may be made in two-bolt segments, the break between a pair of segments on one side of the wheel, coming between the bolts through the segment on the opposite side of the wheel. This prevents a pair of segments coming off when a single bolt breaks or loses its nut.

The segments may also be made in quarter-circles, or even half circles, if deemed best, or they may be pressed or cast to fit the entire circumference of the wheel, in which case, but two pieces will be required. But the difficulty of putting the tire-holding seg-

ments in place and adjusting them by means of their bolts, increases very fast as the number of segment parts is diminished. Probably the single-bolt segments are the easiest of all to put in place, with the two bolt segments a close second.

Possibly it may be found desirable to take each tire, which is to be placed outside—to a circular or a band saw and trim off a portion of the bead as shown by the lines R, R, in Fig. 5. This would permit the outside tires to lie very close indeed at the beaded portion, and it would prevent the very short bend which must necessarily occur near O, O, when the segments Q, Q, are tightened up. The above may, or may not be an advantage. Each man must try it for himself until its value has been demonstrated. But with the tips of the bead removed, the clips, Q, Q, will have a clean bearing against the rim P, no matter how little or how much tire O, O, has been pulled around by the bolts in the segments, whereas without trimming off the beads, the more the bolts are tightened, the more of a wedge-action segments Q, Q, have to work against, rendering it in some cases, impossible to properly tighten the segments Q, Q. The trimming of the beads would remedy this serious matter and trimming seems very desirable as far as limited prac-

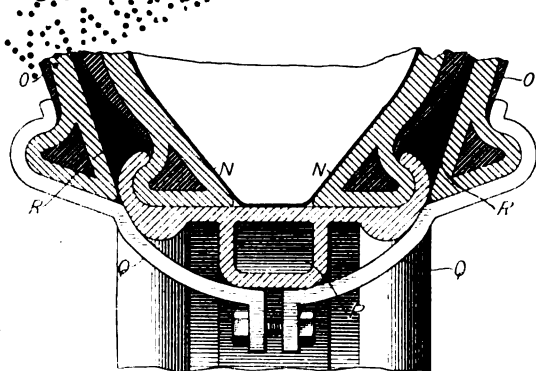


Fig. 5.—Fastening the Second Tire.

tical and theoretical knowledge of the matter has been obtained.

Should the experimenter decide to try the outside tire method without using any segments to reinforce the tire-edges, then he may make things much better and safer by trimming off the point of the bead until the outside tire fits easily against the inside tire just clear of the rim. Indeed, it may possibly be found that under all ordinary conditions, this alone will be necessary, and that unless the service is to be very severe indeed, no segments will be necessary.

The writer has found many times during years of machinery design and construction, that after spending much mental energy in working out mechanical appliances for securing certain results, that said results are not necessary because by making certain slight changes elsewhere, the perplexing conditions cease to exist and therefore need not be considered.

The above looks at first sight as though there were a wide difference between theory and practice, but really, there is not a particle of variation. Theory and practice always agree fully and perfectly when both are right. Otherwise, they differ widely and it may be instantly known that the designer is not fully informed as to the various conditions met with.

The designer cannot make practice agree with theory until he has been informed of each and every condition under which the work must be done. Once he has that information, theory and practice never

have a scrap, and lie together as contentedly as the typical lion and lamb—and the lamb not inside the lion either!

Therefore, conditions must be more fully studied in the matter of using old tires as above described, before the designer of segments can be sure of supplying just what is needed in that direction. There is a strong chance that tire beads may be made of such shape that they will stand the strain, and need no trimming whatever, when they come to the doubling-up process. The metal reinforced bead, will stand the strain, as far as holding in place is concerned, but as stated, the putting the outside tires in place may or may not be found a too difficult operation.

If it be found that segments are a necessity, it is quite possible to design wheel rims which will permit the bolting-on of light segments of pleasing design, when the tires are doubled. Then, there would not be any disfiguring doublelip of segment-material visible between the wheel-spokes to collect mud and to look unsightly. The thin "secondary segments" would be simply screwed to the rim when the tires are doubled, and when new tires become necessary, the only record of the segment-attaching, is the presence of several holes in the rims, these holes being filled, when not in use, by headless screws of non-oxidizable metal, in order to keep out the dirt and water.

In summing up the whole matter, the project seems easy to carry out, and there is no great difficulty in placing and holding old tires on the outside of other old tires on automobile wheels. That part of the matter is easy, and it is also easy to arrange tires for ready application by the double-up process.

But the chief point yet undecided seems to be the effect upon the inner tube, and the behavior of tires which are bunched up in scollops entirely around the wheel. The effect upon wheel, rim, tire and inner tube, cannot be beneficial. It also may not be detrimental to the parts named, in which case the doubling of tires upon automobile wheels may be called worthy of application.

It seems to the writer to be in order for some of the automobile repair men to take up this matter, arrange some simple devices, segments, etc., as discussed above, for double tiring wheels, and then test out the matter thoroughly in order to obtain full data of the behavior of car, wheel, tires and tubes under working conditions. Then, and not till then, will it be known whether or not it will pay automobile owners to double up on the worn tires.

Non-Skid Tires More Common.

The demand for non-skid treads is greater than ever before. Perhaps one reason for this is that manufacturers have developed the non-skid style of tread with marked success. Commenting on the popularity of non-skid tires an official of the United States Tire Company says:

"The best evidence we have of the wide demand for non-skid tires is the fact that both our Nobby Tread and chain tread types are always sold up far in advance of our production.

"There are several reasons why motorists prefer the non-skid style of tire. In the first place there is the ever present protection against skidding. Furthermore, where the tread is raised, the user gets a much thicker and heavier wearing surface. This has the effect of increasing the mileage rendered by the tire. The manufacturer is enabled to place much more rubber between the tire carcass and the ex-

posed surface of the tread than can be successfully utilized in the ordinary smooth type of casing.

"With ordinary usage a motorist should get hundreds of miles of service out of a non-skid tread before the tire wears down to the regular tread surface.

"Another advantage which motorists claim for heavy non-skid treads is that they reduce the number of punctures, throwing off sharp objects entirely or picking them up in such a way that they do not penetrate the casing or puncture the tube."

The foregoing is all very true, but it must not be forgotten that if but half the usual surface of the tire rests on the road, the tire wears just twice as fast as if the tread were smooth. Or in other words, the more pronounced the non-skid feature, the quicker the tire wears down to the smooth surface. On the other hand, non-skid detachable protectors may easily be replaced when they are worn out.

Retreading Tires.

In considering the advisability of retreading, it should be determined whether or not the tire will justify the expense, says an eminent tire authority. The age and mileage a tire has given will, to a large extent, decide this. A tire may outwardly have the appearance of being in good condition, while a careful examination of its interior will disclose a general weakness.

The carcass is the life and strength of a tire, and unless it is in very good condition it will not outwear a retread. Weaknesses are sometimes even invisible on the inside. The carcass is composed of a number of piles of fabric impregnated with rubber, which is cured together. The carcass absorbs the jolts and bumps a tire gets in service and is more or less weakened as a result. The extent of this weakness decides the advisability of repairs or retreading. Again, all rubber goods deteriorate with age, which must always be considered. We might say that one safe rule to follow is not to retread a tire that has been driven more than 3,500 miles. To get the maximum service from a retreaded tire it should be put into immediate use. Retreading does pay, and so does the use of small individual vulcanizers when the work is consistently and properly done.

How to Care for Tires.

When laying up your car for a period, jack it up clear of the floor, allowing the axles to rest on supports. Allow all air to escape from the tires, except enough to shape them, and then examine tires and rims carefully.

If tires are practically new or in good repair, and rims in good shape, it will be sufficient to leave them on the car, taking pains to remove all oil and grease from the tires. Wash them with good strong soap and water. If the rubber is cut to the fabric, be sure to have the injury repaired before using the car again.

Whether or not the tires remain on the car during a prolonged period of idleness, they should be wrapped to exclude the light and should be kept in a room that is not too warm.

Changes Wrought by Automobiles.

The president of the American Motors Company says: "One day we heard C. I. Rufi, a New York milliner, complaining to a Detroit correspondent that the automobiles had hurt the hat trade. He said: 'The automobile has hit the millinery trade hard. Perhaps the other lines of womens' apparel are also affected more or less, but millinery most of all. Almost

anything will do when milady goes auto riding. In summer she wears on her head nothing at all or a very thin scarf; in winter it's a warm hood, irrespective of what headgear styles may be. Gowns may be picked for social functions, but for auto rides comfort and necessities of the weather rule. So expensive summer millinery trade is decidedly a nightmare for the maker and importer.'

"It was only a few days after this that a jewelers' association met and condemned the automobile manufacturers. These men had sales records to show that diamond sales were 50 per cent. less than five years ago. Where people used to buy big display jewels, the size of peas, they now are contented with diamonds for necessities, such as engagement rings and fraternal jewelry.

"We didn't more than get through reading this before the hotelkeepers in some Middle Western States made the protest that receipts were less. Men, before autos became appreciated, in hot weather brought their wives and sweethearts downtown to the hotel cafes for dinners and late suppers.

"Now a few tourists make a hurried night stop at the big city hotel, if a country inn is not in the neighborhood.

"Of course, the theater men have long maligned the auto along with the moving picture shows. About the only come-back there has been in the press were the dispatches in which shoe dealers blamed the high price of footwear to the demand on the tanneries for auto leather."

TRUCK PAINTING.

Details of Doing Work Where Durability and Fairly Neat Finish Are Essential.

BY M. C. HILICK.

Here is a department of work differing to no small extent from straight automobile painting and finishing, although the same painter is expected to preside over it all. In truck painting not only is great durability desired but a good, neat finish is deemed essential, together with certain effective advertising features.

It will be seen, therefore, that a three-fold duty devolves upon the painter. Durability is the first issue to secure, which, in the case of new work, the priming must necessarily be about right. In the case of the metal surface a smaller amount of oil than is used for wood will suffice, the metal being incapable of absorbing and taking care of as much oil as wood. First class metal primers are now being furnished by paint manufacturers at a less cost, gallon for gallon, than the shop-prepared article can be made. Color grinders and manufacturers have made a specialty of getting out metal primers and surfacers, and today they are really furnishing a more reliable and uniformly excellent article than the painter, with his lack of facilities, is qualified to turn out.

In case of making up a shop-prepared primer, use three parts raw linseed oil to five parts pure turpentine for first coat work, using a small quantity of pigment rubbed into the liquids to give consistency to the mass. For the second coat use one part raw linseed to four parts turpentine, adding little more pigment to the thinners. Make sure of getting the surface clean of all grease, oil and other undesirable surface accumulations before coating. If necessary, wash with turpentine. If the insurance regulations will permit use benzine instead at a greatly reduced cost. Run

over the surface with emery paper or No. 1 sand paper. Apply the primer rather sparingly and brush the coat out well. Above all things, get this primer, or first coat, dry from bottom to top. Over the second coat do the necessary puttying and for good work apply three or four or more coats of rough stuff all of which, in due time, should be rubbed down. For rubbing, if insurance policies permit, use gasoline or benzine in which to dip the rubbing stone. If necessary, make this dipping medium of one part raw linseed to three parts gasoline or benzine or turpentine. Omit the use of water altogether if possible. In the event of a rough, uneven surface, put on enough coats of rough stuff to enable the workman in rubbing the surface down to work out a smooth, level surface with no low nor high places.

For a cheaper grade of work, omit the rough stuff and the rubbing, using instead knifing in coats of pigment. This consists of white lead, or some other good filling up pigment, beaten to a stiff batter with one part raw linseed oil and six parts turpentine, and applied with a $2\frac{1}{2}$ -inch half elastic scraping knife. Put this material on as smooth as possible thereby saving a lot of hard work in sand papering the surface down. For this class of work a priming coat, a coat above this, and then the knifing in pigment worked down nicely with sand paper puts everything in good shape to color over. After the color, put on one or two coats varnish color, one coat of rubbing varnish, and then one coat of finishing varnish.

Conditions and circumstances will, of course, suggest variations from the above to meet requirements, but for general practice the above gives an outline of doing the work. Motor truck and wagon work demands a better grade of finishing than formerly and this calls for a higher grade of finishing results promises to continue.

In all this work the advertising possibilities of the motor truck and wagon is deserving of mention. To meet requirements in this direction, the striping and lettering, and notably the latter, should be done in a manner to attract attention. This work should not be overdone, and the color effects need to be fine and good, but not loud and sensational. Neat, effective lettering, plain and easily read, gets more attention and is a better advertising feature than the fancy, ornate style.

Recommends Tire Chains.

The commissioner of highways of one country, who is himself an enthusiastic motorist, has gone into the matter with great thoroughness, recommends that wheels of all motor cars be equipped with tire chains in rainy weather or at any time when the roads and streets are in a wet, slippery condition. The commissioner finds that 90 per cent. of the auto accidents reported to him were caused by cars, not equipped with tire chains, skidding into collision with other vehicles or stationary objects, like telephone and trolley poles, trees, etc.

It is not good policy to allow the high tension cables to rub against metal parts, especially if they are hot. They will chafe, or the insulation will be destroyed by the heat.

Nothing gives more confidence when far away from home in a hilly country and on bad roads than the knowledge that there is plenty of gasoline in the tank.



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered, as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

970

Bothered with the Rain.

From G. E. L., Massachusetts.—The writer has a 1912 Ford torpedo runabout which gives perfect satisfaction except in one way. After having stood out in a shower or rain storm it is almost impossible to start the engine. The water will run down the top, glass front and dash, and instead of onto the hood and off, it runs under and all over the engine. It also comes in through the long hinge on the top of the hood. If you or any of the readers can give the writer any help on this matter, either as to starting engine when wet or keeping the water out, the same would be much appreciated.

Reply.—The construction of the hinged hood is such that keeping the wet out is something of a problem, particularly if one does not care to injure the appearance of the car by adding some sort of waterproof shield, such as khaki to cover the long hinge. Water entering here does practically all the harm. To start a wet engine is rather harder again, than keeping the water out. We shall be very glad to hear from some of our readers who own Ford torpedo runabouts, 1912 model, who have experienced these troubles and who have been successful in overcoming them.

971

Faulty Carburetion.

From L. A. Maxfield, Michigan.—I am having a little trouble with my car. It is a two-cylinder Rambler. I can't start it when it is cold unless I prime one of the cylinders and flood the carburetor. Then it will start but if I wait a little it will run down, and by holding two of my fingers over the air it will pick up again, and it doesn't seem to pull so good on low, but as soon as I throw it into high it will pick up again, and can throttle it down so there is no sound only the chain. It pulls good on low after I have run a little. I use a Delco coil and the ignition seems to be all right.

Reply.—It is quite evident that your trouble is due to carburetion, as holding your two fingers over the air intake increases the vacuum at the spray nozzle and draws in more gasoline. There is apparently too large an opening for "fixed" air through the carburetor to properly vaporize the gasoline when starting, the gasoline now being harder to vaporize than a year or two ago. The further condition noted that the motor runs more evenly when running slowly on direct drive shows either one or two things, either there is a great deal of power lost from friction when in low gear with the motor running fast when it should develop more power, or else the carburetor adjustment for high speed is incorrect. You neglected to say what car-

buretor you were using, an important omission. We do not think you have any ignition trouble as no symptoms of such seem to be present. Your saying that it pulls better on low after a little running would seem to indicate a collection of unvaporized gasoline in the inlet manifold. You may have to preheat the air slightly before entering the carburetor, or use heat around the carburetor throttle to get more complete vaporization.

972 **A Metallic Clicking Noise.**

From A. M. Lavallee, M. D., New Hampshire.—My car is a Model 29 Jackson, 1911, with cam shaft over head, and valves in cages at an angle on top of the cylinders. No. 2 cylinder has very little compression, although the valves and their cage seats have been ground, and seem to be gas tight. The exhaust valve of the same cylinder makes a loud metallic clicking noise apparently when it closes against its seat, because when I press down hard on the head of the stem enough to prevent the closing of the valve, the noise ceases. The engine never skips either at low or high speed, but it does not show the power it used to.

Reply.—You cannot expect your engine to run satisfactorily unless you have good compression in all cylinders. This is a pre-requisite in every case. The metallic clicking noise in the doubtful cylinder may be the result of a bent valve stem. It should be put in a lathe and tested. It means, if bent, a new valve, as it is practically impossible to straighten a bent valve stem. A new valve, if it remedies your compression loss, will probably show better power.

973 **Heats and Does Not Pick Up.**

From Jas. Ball, Nebraska.—I have a 1910, four-cylinder, 30 h.p., Reo car. All repair men say the spark is all right and in good time. It has a Stromberg carburetor with three adjustments. The compression is good. It runs the same on batteries as it does on the magneto. You can adjust it to speed, but when running along it has no life. It will not pick up. It heats up badly. I have not found any one around here who can do the car any good.

Reply.—If your compression is good, not fair, and as you say ignition is perfect, it looks as if carburetion troubles were present. The "pick up" feature described looks as if your carburetor was adjusted by rule o' thumb, the old story over again. You are using too much gasoline at your low and intermediate speeds. The result is it does not all vaporize and some collects in the manifold between the carburetor and cylinders. As soon as you open the throttle this "trapped" gasoline is drawn into the cylinders, choking the power of the engine from too rich a mixture. You should lower the float and adjust the engine to low speed first, then adjust for high speed by changing the tension of the automatic air valve. The heating up is probably a result of too much gasoline. Similar inquiries to yours have been answered in these columns many times during the past year.

974 **A Grinding Sound.**

From Harold Rutley, California.—I drive a Reo (1912 model) about which I would like a little advice. This car has run about 2,800 miles. Lately, near the end of a long trip a grinding sound started on the car. This noise was particularly noticed when the gas was shut down, which caused a back lash on the

gears. This noise continues when coasting with gears in neutral which proves that the trouble is somewhere between transmission and the drive wheels. A good garage man, who is working on the car now, thought that the drive shaft had slipped, which let the gears in the differential go too far in mesh. Would like to know from owners of Reo's or other makes if they have ever experienced anything like this? I am satisfied that the differential, transmission and universal joints are oiled O. K. Any advice you can give me will be appreciated.

Reply.—Grinding is caused in at least 99 per cent. of all cases by gears not running on their pitch line, either worn bushings or bent shafts, and occasionally by gears meshing too close. Bevel gears do not usually have this trouble for the thrust usually drives them in the opposite direction, away from each other. Our diagnosis is imperfect alignment. Remedy, new bushings, adjustment of thrust bearings or straightening the shaft that is bent.

975 **One Cylinder Misses.**

From L. A. Stafford, New York.—Will you kindly let me know what is the trouble with my Model T Ford two-cylinder car? When I put it into hard work the back cylinder will miss. If I throw into low gear I cannot make it miss but I am unable to make it run any length of time on high without missing. I have a new coil, Model E Schebler carburetor, good compression, new Rajah spark plugs and have tried all kinds of adjustments but thus far have found no remedy.

Reply.—The misfiring that you refer to, at high speed, is often caused by loose circuit connections shaken out of position as the engine speeds up—possibly your vibrator adjustment is not correct. This will sometimes give a slow rate of vibration which cannot keep pace with the requirements of high engine speeds. You speak of a two-cylinder Ford car. We were not aware that there were any two-cylinder Ford cars made. Possibly you may have some old model, and if so, and the car is equipped with a battery rather than a magneto, it may be due to the fact that your battery is run down. This is about the best information we can give you based upon your rather meagre statement of conditions.

976 **Probably Too Rich a Mixture.**

From A. J. Karker, Wisconsin.—We have just purchased a new Courier 1912 model, which is causing us some trouble which I would like you to give me some information about. First thing is the car uses a great amount of water in very hot weather, on an average of about a gallon and a half to every 20 miles, and unless we keep filling it in it will overheat. We have cleaned the engine and radiator out well but that did not seem to help much. It does not leak but it seems to go out of the overflow pipe. Do all these cars do that? Second, the motor does not seem to have enough power when the car carries five people. When you get on hills the motor dies down and you must shift to second and sometimes to first speed where other cars of 30 h.p. make on high speed. On the level road the motor has all kinds of speed. When you open the throttle suddenly you must retard the spark entirely and when you have a hard pull also, otherwise the motor will knock fiercely and with the spark retarded you have no speed to get a good start.

The motor has good compression and the carburetor is adjusted all right. Can you give me any informa-

tion as how I can correct this trouble, and do other Courier cars do this? Third, the feed pipe sometimes seems to stop off the gasoline especially on hills when the gasoline runs lower than six gallons in the tank; it seems as though a vacuum forms in the feed pipe as there is never any dirt of any kind to be found in the tank. When you take off the feed pipe at the carburetor it runs for a second, then it stops for a second and then it will run all right sometimes for three or four days until it does the same thing.

How many years has the Courier Clermont been manufactured and is it an assembled car or is it built entirely by the United States Motor Company?

Reply.—The large amount of water evaporated, the knocking when suddenly opening the throttle, and the low power on hills, all seem to indicate but one thing—too much gasoline, a result of improper carburetor adjustment. The advance and retard of the spark should be proportional to the speed of the engine, advancing as the engine speed increases and retarding as it decreases. The knocking described is undoubtedly due to too rich a mixture. It looks as if there was some obstruction in the gasoline feed pipe. We should advise that you clean your tank out thoroughly and with the filling plug removed blow back through the gasoline piping, then flush the tank and pipe with gasoline. Always use a dry clean chamois skin, through which to strain gasoline when filling the tank, to keep dirt and possibly some water out of tank and piping. We cannot offhand tell you how long the Courier "Clermont" has been manufactured. The United States Motor Company build all their cars.

977 Fails to Easily Start.

From J. W. Soderberg, Wisconsin.—I own a Model T 1912 Ford touring car, which has run about 1,500 miles. On several occasions when I have been running the car and have stopped it temporarily and then attempt to start it, it would fail to start for some unaccountable reason. This has happened especially when the car had died down on high, where I would be running in sand for instance, and where I would not have the throttle open sufficiently wide to enable me to proceed, except very slowly. Upon attempting to start the car on these occasions the compression seemed to be very weak. The compression otherwise is very good as I have ground the valves recently.

Is it possible that the piston rings stick so as to permit the gas to escape? If they do stick, why do they stick? This never happens when the car is standing in the garage but only when I am on the road. I have also discovered on these occasions that the magneto will not deliver a spark, sometimes. I can readily see that if there is no spark there can be no explosion, but there will be a spark sometimes and still I am unable to start the car. In each case there seems to be little or no compression in the cylinders. After I tinker with the car long enough and crank it for a sufficient length of time it will start up but I never have been able to discover the cause. After the car stands awhile and after I have cranked it long enough the compression seems to come back and then the car will start. The car runs good except that it is prone to heat and boil water.

Will you kindly give me your opinion in the enclosed stamped envelope as to what the trouble is and what the remedy is? I am a subscriber of your paper, The Automobile Dealer and Repairer.

Reply.—When a gas engine stops from excessive power demands, as on high speed and in a heavy hard

road, there is usually a very poor mixture of gas left in the cylinders. This is because the velocity of the air through the carburetor is not sufficiently high to properly vaporize enough fuel. In case the compression is weak, as in your case, it is more likely caused by valve stems sticking slightly in their guides, thus preventing the valves from seating properly than from sticking piston rings. When piston rings stick in their grooves they do not readily loosen themselves. Occasionally it happens that the valve stems will lengthen under heat and are thus prevented from properly seating. In a Ford motor, loss of compression can only occur through the valves, past the rings or between the cylinders and heads. When the magneto fails to deliver a spark you will probably find the brush at the top terminal has some carbonized hairy fibre attached to it. These should be carefully removed. It will sometimes be found expedient to close the spark gaps in the plugs slightly to insure better magneto ignition. Your motor should be equipped with spark plugs with priming cups attached, so that you can prime the cylinders with gasoline to assist in starting. You cannot expect easy starting if the compression is at all weak. The tendency to overheat and boil the water is very likely due to your running the car with too late a spark, which consumes too much gasoline with resultingly excess heat in the cylinders, or an adjustment of the carburetor that gives too rich a mixture.

978 Uses Much Lubricant.

From J. W. Russell, Nebraska.—I have a Model T Ford car, 1910, that has been run 6,000 miles. It pulls good and has good compression, but I can't run over 100 miles on a gallon of Polarine oil. If I fill the crank case up so it is between the two cocks it forces the oil up in the cylinders and shortens the plugs. The first one is the worst. Are the rings worn? The compression is as good on that cylinder as it is on the others. There is a partition between the crank case and the transmission case. If I remove it do you think that will help it? I put the oil in at the top of the transmission case instead of at the place in front of the engine. If I put in new cylinder rings are they liable to scratch the walls of the cylinders?

Reply.—There is little doubt but that your motor needs new piston rings, although a heavier grade of Polarine oil might help you. Under no conditions should the partition be removed, unless you have the price for a new motor, and desire to pay well for the experiment. New piston rings are not at all liable to scratch the cylinder walls, the surface of which is glazed to such an extent that a file would probably not make any impression on the glassy surface.

979 Carbon Removing.

From Louis F. DeWolf, Indiana.—I am the owner of a two-cylinder 1911 Maxwell Runabout. I have never had any trouble with this motor heating until this Summer. I have two or three times cleaned the carbon from the cylinders with Prest-O-Lite Carbon Remover but even immediately after using it (having let it remain in the cylinder all night) I notice that after driving a few miles that the motor gets very hot and after turning the switch off that by turning the engine over with the crank that it will fire on one of the cylinders. Could it be that the carbon remover does not properly clean the cylinders? I have very good power and experience no trouble in driving except that I know the motor is heating

too much. I use good oil, in fact, I have changed oil two or three times buying the best on the market.

Reply.—The absolutely sure way to remove accumulations of carbon is to take the cylinders off and use carbon scrapers. In your case we hardly believe that carbon accumulations cause the overheating, particularly as you do not report pre-ignition. Your motor being of the horizontal type, no carbon remover would be so effective as would be the case in vertical construction. We are inclined to the belief that your water circulation is impeded and that there is not sufficient radiation due to an inefficient pump or a partial clogging of the cylinder jackets, water piping or radiator either singly or combined. It is the nature of this particular motor to run fairly hot, but it should not fire on either cylinder with the switch in the "off" position.

980

Truss Rods.

From Ray Spencer, Iowa.—I wish to question you in regard to a Ford model "T" truss rod. We have had quite a little trouble with geers stripping in our good Ford car, so we put a truss under the rear axle from wheel to wheel. This did no good so far as we can see. Would a truss from the differential to the torsion tube do better?

We have a model "F" Buick which runs fine on batteries but when turned on the magneto she will back fire through the carburetor no matter how you adjust it. The battery current runs through the magneto breaker on the magneto so it can't be in that. The magneto throws as strong a spark as the battery, I think.

Reply.—We do not believe that trusses will help the construction, but think on the contrary that they will be detrimental, the tendency being to throw the parts out of alignment, rather than to correct it. Had you mentioned the make and model of magneto it would have saved us the trouble of looking it up. We find that this car has Remy Type S equipment, the same breaker operating both battery and magneto current, igniting on the make with vibrating coil and on the break when switched to the magneto, in the latter case considerably later than when running on batteries. If your engine runs satisfactorily on batteries it shows conclusively that your carburetion must be correct or fairly so, and we cannot for the life of us see why you should "monkey" with the carburetor to attempt to correct ignition trouble. Your magneto apparently needs careful attention by one who understands its construction. We advise that you send it to the nearest Remy service station, which is probably Chicago.

981

Engine Blows Back.

From Floyd Keating, Michigan.—I have an International automobile buggy, 1908 model. Please inform me what to do when the engine blows back through the Schebler carburetor at all speeds, no matter how I adjust it. I use a vibrator coil which came with the car and a Leavitt timer. Should the spark appear at both terminals at the same time when we use dry batteries?

How can I keep the bolts secure that the front axle turns on—that is, the bolts that go through the axle where the wheels turn? I don't know what to call them.

Reply.—By "International" you probably refer to the I. H. C. buggy of 1908, a rare old vintage, practically forgotten. If there is a blow back through the old Schebler D carburetor there would probably be one through any other make or model. The blowing back through the carburetor is caused by the automatic inlet valves not seating properly. If they lift too much they will leak, if they do not lift sufficiently it will cut down

the efficiency. If the springs are too weak there will be resulting leaks and if too stiff there will be loss of power. It was to overcome the serious disadvantages of automatic inlet valves that practically every engine in use today for motorcar purposes has positive operated inlet as well as exhaust valves. The spark should not occur simultaneously at both terminals. We are not familiar with the Knuckle construction, and are therefore unable to advise you. We suggest that you address the engineering department of the International Harvester Company, Akron, Ohio.

982

Wrong Carburetor Model.

From Dr. F. H. Fleege, Illinois.—I wish to ask some questions through your Trouble Department. I have a Buick, model 19. It has a Schebler model D carburetor, a Remy type G magneto, dual system. The motor will start on the battery all right and will run on the magneto about five minutes. Then it will start to miss and will continue to miss on both magneto and battery. I have had the motor down and cleaned it thoroughly and made all adjustments. I can get the carburetor to work fine for the first five minutes. The platinum points in the breaker are very thin. Would they arc and so cause it to miss, or might it not be a short circuit in the wire? I have gone over the same but fail to find anything wrong. Also does a Buick 19 fire 1-3-4-2 or 1-2-4-3?

Reply.—As your motor will run on the battery and not run for any length of time on the magneto, it conclusively shows that trouble exists either from demagnetization of the magnets or in the breaker box. We are inclined to believe that the chances are about even up. The Schebler Model D carburetor is an old model and not nearly as well adapted for the present heavy gravity gasoline as their later Model L which is practically the only model now used for motorcar carburetion. The platinum contact points should be "dead" smooth and should meet squarely together. There should be no oil or grease in the breaker box, as it will give all kinds of trouble causing imperfect contact. The condenser in the magneto prevents arcing. You may need new contacts. The Buick 19 fires 1-3-4-2.

983

Engine Overheats.

From D. N. Shaner, Indiana.—I have a McFarland six-cylinder car, and the engine gets awful hot, and the water boils in the radiator. What is the cause?

Reply.—While we, of course, cannot tell you just what causes the water to get so hot that it boils we can tell you practically all the causes for over-heating. Your radiator may be filled with lime or other deposits to prevent sufficient radiation; cooler may be too small; circulation of water may be insufficient due to inefficiency of the pump; spark may be set too late, or piston rings may not hold compression and allow the hot gases to pass into the crank case. Broadly, trouble such as you describe is caused by insufficient radiation, or the burning of too much gasoline, the latter covered by too late setting of the spark or leaks past the piston rings.

For the Rear Axle Grease Trouble.

From Ralph W. Reimann, Indiana.—For the benefit of many Ford owners who have trouble with the grease coming out of the rear axle, I have successfully stopped it, and here it is: Remove the rear wheel. Next unscrew the grease cup and use that hole to help get out the roller bearing. Then put a steel washer on the axle in the housing. Next put a felt washer on and then another steel washer; then your roller bearing. Then put back your other washers as

before. I forgot to say: Get two steel washers like the one that is in the front of the roller bearing, as that size will fit on the collar in back of the roller bearing. I did that two months ago and haven't had any grease on the outside since. I tried nearly everything else without success. I had five holes in my housing, but those I have now closed up by putting in short bolts, tapping the holes and screwing the bolts in.

A Bent Switch.

From E. C. Chamberlin, Iowa.—I had about the same experience as No. 934 had with his Buick No. 10 as stated in your last issue. I found two things that caused the trouble. One was that the switch was bent so it did not make a good contact on the magneto side. The other was with the battery and bell. I could not ring through the first cylinder connection in the distributor. I do not suppose the Remy Company would approve of my procedure, but I cut a hole in the side of the distributor case and ran a high tension wire through it and soldered the wire to the pin in the side of the distributor case. I then soldered the other end to the outside connection where the spark plug wire fastens. Rest assured I could then ring through that connection. I also got an even running motor. I think it well to scrape the connections free from grease in the distributor. The cam should have a little vaseline or castor oil on it, but put none on the platinum points. I have found Remy magnetos that had bad distributor cams. I am of the opinion that they should be used with a solid one piece wire from the distributor through the hard rubber to the high tension or spark plug wire connection. This wire is now in two pieces and is not soldered together. It thus either corrodes or the rubber cuts between the joint and there is no spark on low motor speeds. If Mr. Eginton will press in on the switch when his motor is missing that will tell him whether it is a switch or not.

Sane Driving and Less Speed.

From R. D. C., Nebraska.—My idea of what we most need in the automobile is less speed, less weight, larger tires, and above all, sane driving. I can see nothing in fast driving except that it courts danger; there certainly is no pleasure in it, and pleasure is what most of us use them for. Racing an engine over the public highways at railroad speed spells danger to me. I think there should be very stringent laws to prohibit it. If men want to race on tracks and get killed that would be all right. Cut down the speed and eliminate the danger and in my judgment there would be more automobile enthusiasts. Of course there are some who want speed, but I believe there are more who want safety. I know of a number who would own cars but they read of the terrible accidents daily and are afraid to buy them. I am a careful driver and get a great deal of pleasure out of my car and have had no trouble to speak of, save a little tire trouble. I drive a Franklin Model G. Have driven over 7,000 miles and not even punctured my rear tire. Moreover, I have had no breaks or expense on my car. I attribute my success more than anything else to careful driving, although my car is an unusually good one.

No Use Getting Angry.

From G. L. Lapham, Ohio.—I had trouble for one week with my Ford Model T touring car, running jerky and noisy. At times it would run all right,

then again it would be all wrong. What the trouble was I did not know. After looking for a "short" or something else for several weeks, I made up my mind to find the trouble or get mad. So I took off the cylinder head, cleaned out the carbon, ground in the valves, cleaned out the carburetor, looked the wiring all over, and then I put things all together and thought I had her all perfect, but she was no better than before. I was not mad yet. I knew there was a cause for the trouble and all I had to do was to find out. So I took the radiator off again, took the cover off of the timer, and here is what I found: The nut that holds the timer on was loose. It would work back and forward, and at times would touch the cover on the timer. That is what caused all the trouble, and I got my machine running all right again. No use getting mad; just hunt.

Likes Mica Spark Plugs.

From L. C. Greene, Iowa.—I had used a set of mica spark plugs more than a year. They began to get weak. I got a new set of eight porcelain plugs. They would often go bad, and in a year I had bought eighteen plugs to keep four going, and then it was not satisfactory to have the engine go lame so often and to test out the plugs and find a weak one. The old mica plugs that give such good service lay up on the shelf. I soaked them 48 hours in gasoline, adjusted the points, put them in place and the engine went off as if everything was new. Before putting the plugs in gasoline, I took one apart. The mica was some blacked and greasy and I could not get the mica back in place again which suggested soaking in gasoline. Now was that mica magnetized so that part of the circuit was wasted or did the grease interrupt it and did time or gasoline or both put the plugs in shape for service again?

My carburetor has but one adjustment, the needle valve. Turn the needle valve down till the engine will sputter and fuss a little the first 20 rods, then it will settle down to business for all day. This makes a weak mixture and one cannot run so fast but it is better many times. One gets more miles out of a gallon, and the engine stays clean. The car is slower to crank so use the primer a little. There are three feet of pipe between the carburetor and the engine, so when it has stood over night it takes more turns than most engines to start it, but for a short stop it starts as readily as any, but that long pipe passing over the top of the engine prepares a nice gas for the cylinder. This is the third year for my Rambler roadster, Model 44 A.

Starting Ford Cars in Cold Weather.

From Dr. G. E. Mershon, Illinois.—I read your journal every month with the same interest that I read my medical journals and out of every number I get many practical points as to the care and operation of automobiles.

My object in writing you is to give all the Ford owners a simple way of starting their cars in cold weather. I speak from practical experience, having had no end of trouble myself to get the engine going in cool weather in winter or summer. The ether method, written of in your publication last winter was good but mine "beats it to a frazzle" and never fails if the car is in running order. The method is to prime the carburetor, then pour a quart or so of hot water over the carburetor, and in very cold weather over the intake manifold, then crank up. "There's

nothing to it," she'll take every time, as the gas is warm and vaporizes quickly causing easy ignition. I trust this will obviate any further trouble for No. 966 or any one else who has a similar "case."

Defective Lubrication.

From L. C. Greene, Iowa.—To J. L. Williamson of Wisconsin in the August number: To my mind a wholly splash system of lubricating the engine is not an entire success, though many standard makes of cars use no other. The trade, or a part of it, demands a lower priced car, and with some other things in turning out a lower priced car the oiling system is cheapened. My car has a mechanical oiler that supplies oil to the cylinders on the side as high up as would do, so the surplus would run down and supply the crank case, but in so doing too much oil worked up and dirtied valves and plugs, so I reduced the amount till the valves would keep clean, and then put a little oil in the crank case occasionally to keep up the supply needed I now have no more trouble that way.

Too Much Oil.

From Garrett Dyer, Kansas.—I wish to tell Mr. Quante, 966, that he is using too much oil. I get better results by no using so much. I use just enough to run out at the lower pet-cock. I think the vibrator needs adjustment. Look after your wiring. My Ford model T did just as he says his did. I put on a battery of six dry cells. It did no better until I got vibrators adjusted and I tightened up my wires. The wires from the spark plugs were all loose at the coil. The magneto wire was loose at both ends. Strange to say it would run very nicely, however, after being started, but it was so hard to start I had to pour hot water on the carburetor.

Nevermiss Spark Plugs.

From R. E. Ferson, Massachusetts.—In the August issue, I noticed that J. L. Williamson of Wisconsin is having trouble with dirty spark plugs. If he will use a set of Nevermiss Spark Plugs he will not have to take them out, no matter how much oil he uses. He should use No. 8. I have used a set of these plugs nearly a year and can burn all the oil I wish. They have never been cleaned. They are made by the Lockwood-Ash Motor Company, Jackson, Mich.

That Oil in One Cylinder.

From L. C. Greene, Iowa.—To J. G. Baker, Illinois, who has too much oil in one cylinder: I had the same trouble in my second cylinder, but took the plate off the side of the crank case. The car had stood over night, and by careful measurements found that the oil scoop to that second cylinder dipped one-eighth inch deeper in the oil at each revolution than the others. I filed it off to match the others and that trouble was stopped.

Carburetor Improvement.

From Walter Kimmel, Michigan.—Quite a number of carburetor manufacturers do not make provisions to adjust the gasoline level although it would be an important thing if they did so. Without this adjustment, when the float valve wears on the valve seat the gasoline level will raise. A good way to adjust the same is to loosen the float screw and slip a piece of metal between the hinge and the cork float.

Good Advice to Car Owners.

From W. L. H., Massachusetts.—I have read with so much interest at various times, the experiences of some of your readers, that I feel like giving you part of mine. I am running a touring car. I bought it early in the spring of 1910. The agent, after he had received my money, managed to find time to go out with me twice. The third time he was to go, was on Sunday. I went to the garage, but he had gone fishing. My car was all covered with mud and one rear wheel out of line. We got the car out, however, and started for a ride. I found the radiator leaking badly and something wrong with the steering post, as I could hardly turn it. The next day the agent said he would fix the steering post. After spending several days he gave up the job and sent for a new steering post. I was out of the use of the car for over a week, but paid him \$7.85 for express charges and labor. The radiator continued to leak for several months. He repaired it several times and I spent about \$10 on it beside my time, until I finally was disgusted and told him so. He then sent it back, and put on a new one. I paid the expense charges, also an additional \$5 for repairing the old radiator. Every few weeks my engine had to be cleaned and then my rear axle went wrong. The spider in the differential broke. A little while afterward, I noticed that most every car of that make about here, had put in a new axle. Instead of putting in a new spider and cutting down the bushing to fit or putting in new bushings, which would have cost me \$2 and labor, they sent for a new axle and soaked me \$50 with some \$12 for labor.

Then I had a knock. Now I have worked along mechanical lines for over 30 years and thought I knew just a little, but the agent and his master mechanic (who came in town from the farm some three or four years ago, and at that time did not know the difference between a monkey wrench and a spark plug), told me I had a loose bearing on the crank shaft. I disputed the matter, which made them both mad, and to prove it they said they would take the engine out, and if it was not caused by a loose bearing, it would cost me nothing. They took the engine out. There was no loose bearing. We replaced it and had the same identical knock. Later on, I received in my bill an itemized account for work done. They not only charged me 50c. per hour for a \$15 man, but charged me for twice the number of hours they actually worked. In taking down the engine in order to get the rear bearing off, they took a bolt out of the fly wheel. When this bolt was put in, it was not done right, and about a month later in coming down off the mountain, this side of Lenox, Mass., it worked loose and stopped my engine. With the aid of a farmer's son I took the engine out, put in the bolt properly and fastened it, put the engine back in place and was less than four hours doing it.

It has taken me some time to find out that the best thing you can do with a car is to keep every part well oiled. Keep your gasoline tank filled and leave it alone. I have not touched my car now for nearly a year. The valves have not been touched for 18 months. Never allow your valves to be ground as long as they seat tight. I have not touched my car in any way for a long while. I use Flash in my cylinders. I did use common salt and kerosene oil. It is just about as good. I can climb almost any hill on high and I have run over 20,000 miles and over some of the worst hills, roads and mountains.

Now as to the knock, I think most of it comes from

too rich a mixture. Shut off the flow of gas in your carburetor just a little. Try it several times, just a little at a time, and you will get it right after a while.

If necessary to do repair, and you have the disposition and time, just study the constructions of your car and do it yourself. The car I refer to is so simple that any one can do what repair work you should find necessary. You would then save yourself the disgusting experience I have gone through, and the tiresome work of going over work done by men who are not and can never be, mechanics, but still have the nerve to charge you about twice what a good mechanic is getting right here in our city.

Flooding Cylinders Avoided.

From Herman Windfohr, Maryland.—Should E. N. Whitcomb, as in the issue of May, Inquiry 874, still be having trouble with his 1906 Franklin car, I will be glad to give what information I have acquired with my 1907 Model G Franklin.

I see in your last issue that trouble occurs from cylinders flooding lubricating oil. I think most of this trouble may be from a carbon scale getting in the rings. After cleaning my cylinders lately the fourth cylinder kept flooding oil through the exhaust valve. My usual remedy of putting kerosene through the spark plug hole seemed to fail to remedy the flooding, but after running about 20 miles all of a sudden the trouble disappeared and has been all right ever since.

Miles Per Gallon of Lubricant.

From James Paul, New Jersey.—I have noted with interest your article in the August number on lubricants for Flanders cars, and I am surprised at the statement your correspondent makes about his 1912 model—using one gallon of oil per 225 miles. If my Flanders used as much oil as this, I would be alarmed, as I never get less than from 400 to 450 miles per gallon out of Havoline Medium.

Address Wanted.

Can any of our readers give us the address of the manufacturers of the Rogers Speedometer? A subscriber is anxious to get it.

The Motorette Again in the Market.

It will be remembered that the former manufacturers of the three-wheeled car, called the Motorette, were unable to continue business and suspended some time ago, owing to their inability to get parts for the car. Since that time a new company has taken hold and started putting out cars. The new company will manufacture their own motors and they will use a four-cycle motor of standard make instead of a two-cycle motor as formerly used. Although the old style Motorette has proved successful in every way, the new style, which has been adopted after a year and a half use in the hands of customers, is said to be even more efficient than the old model. It is an extremely easy riding car regardless of road conditions, and in the matter of upkeep it is claimed that it is cheaper than anything save a bicycle or a motor cycle. The price is but \$350. The new company is a small one and will put out Motorettes in small quantities for the next few months, but the car is one that will meet a long-felt want and it should have a wide sale. Those interested can secure further particulars by writing to the Kelsey Motor Company, Hartford, Conn.

MUST HIMSELF DRIVE.

The Most Daring Racers Do Not Like to Trust Themselves to Others.

One of the great racing drivers of this country, J. A. Nikrent, said the other day that he is frightened all the time he is in an automobile when any one else is driving. He tells some interesting experiences, and the following is worth reading:

"I was driving in a nerve-racking race at Grand Rapids, Mich., on a track that had some dangerous curves. The track was too soft anyway, and we had incurred the enmity of several horse racing men because we had contracted for the track. They thought that the course would be ruined and they refused to listen to argument or to our assurances that the track would not be injured in the least.

"I was near the finish of a race for about ten miles and was coming down the track toward the last quarter pole when I noticed a man leap from the bushes at the turn where the car was to come into the home stretch and deliberately throw a long four-by-four rail across my path. I knew the meaning of the act and the terrible consequences if I were to hit the obstruction. My speed was something like ninety miles an hour and there was no chance to slow down. There was no hope unless I could make a turn close to the fence and run another risk of turning too short and toppling over. I had no other alternative so I guided the car with the greatest skill I could muster to my aid. I realized that if I struck the rail, I would be hurled from the machine and probably be thrown under the car. I came closer to the fence than I had ever driven before and must have missed the rail but a few inches.

"When the mechanics learned of the narrow escape they armed themselves with wrenches and started out to find the perpetrator of the deed. But the man who would have caused my death was nowhere to be found. Many persons thought that the story of the close call was a fake, but I know—and I hope I never have such an experience again.

"All drivers have gone through such scares. I remember when Joe Lawson in the Vanderbilt race a year ago struck a man who was crossing the track. Joe was driving at a tremendous speed and ran into the man while taking a turn. Something struck Joe in the chest and he thought it was the head of the victim. He stopped the car and laid down by the roadside and cried like a child. After six minutes, someone assured Joe that the man was not seriously hurt and that it was the man's shoe that had been mistaken for a head. Joe crawled into his machine and drove with the frenzy of a demon. Although he was six minutes behind, he made such time that he was but two seconds behind when he went across the line.

"It may sound strange to some persons that I am scared all the time I am in a car someone else is driving. Disbrow and I are the same way in this respect and we can't ride together. Often when we are invited out to dine and a chauffeur comes for us, it is in fear and trembling that we remain in the car. I usually tell the driver that he will either have to let me drive or go slower for I would rather walk than run such a risk. So many drivers think we are never satisfied unless we are going at least a mile a minute. I am never at ease unless I am running the car and then I realize that the responsibility rests with me unless something happens that is beyond our control.

New Standard Dayton Models.

Featured by a six-cylinder Knight engined car substantially the same as built for the past season, but with option of wire wheels and several minor refinements, the Stoddard-Dayton line for 1913 continues four highly successful models embodying three types of power plants, the Knight sliding sleeve, the valve-in-head and the motor en bloc. The latter type, having been used for several years, is employed in two popular priced cars developing 30 and 38 h.p., while the valve-in-head motor, representing eight years' development of the well known Stoddard-Dayton rocker-arm motor, is retained and refined for the 48 h.p. cars.

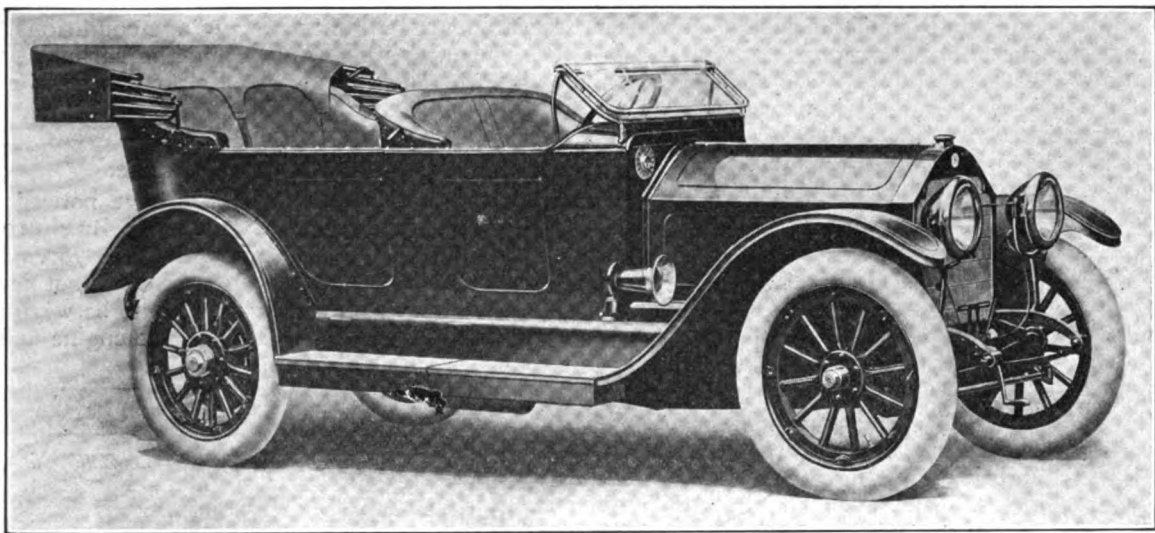
The model illustrated embodies the Knight engine principle. That is a 70 h.p. six cylinder car with left hand drive and center control, which has met with marked success during the past year and is now further refined in its details.

The cars will list as follows: Knight Six, \$5,000; 48

Knight Six is longer and generally larger than has been used heretofore. The extra seats are built to be folded and they disappear in the back of the driving seat. The body curves have been slightly changed to make them more graceful and the cowl of the dash has less angularity than last year's Knight Six. Nothing has been done, however, to mar the straight flush side effect which has found wide appreciation.

Accessories are treated in a somewhat different manner. The electric side lamps are built into the dash rather than attached to brackets. They are built into the center of ventilators, the two forming a unit. The head lamps are finished in black enamel with nickel trim and the lighting of all five lamps is accomplished by an engine-driven dynamo furnished as regular equipment.

The general character of the luxuriousness is well indicated by the additional equipment which includes the finest quality mohair top and top boot, storm curtains, windshield, seat covers, electric horn, trunk



Stoddard-Dayton Knight Six.

h.p., \$2,800; 38 h.p., \$1,850, and 30 h.p., \$1,450, all fully equipped. The prices are the same as the corresponding models of the past year but each model represents greater value through the addition of equipment, finer finish or mechanical refinements. In some instances all three of these factors apply.

All types of standard bodies are fitted to the 1913 models, except the "30," which takes only a touring car and compartment roadster body. These roadsters, however, are one of the unusual examples of Stoddard-Dayton body design representing ideal conditions for the carrying of baggage and protecting it from dust and water.

Improvements have been effected in the original design of these bodies making them more to be appreciated than ever before. In the upholstering of the back of the seat there is a trap section which may be pulled forward making a large opening into a compartment in the rear of the seats. This compartment is entirely enclosed by a metal deck and is roomy enough for two large suit cases and some smaller baggage. It may be opened without getting out of the car. Another advantage is the fact that the compartment design does not encumber the large gasoline tank in the rear. It simplifies the refilling of the tank without compelling passengers to alight.

The new touring body of the Stoddard-Dayton

rack, speedometer, shock absorbers, demountable rims, running board tool boxes with aluminum covers, metal enclosures between the running board and frame, robe rail, foot rest, foot accelerator, tire holders, tire irons, tire repair kit, tools, and extra demountable rim. Choices of color and upholstery schemes are given.

Among the structural changes in the Knight are a new design of I-beam front axle, an improved steering gear of the worm and sector type, mounted on roller bearings; a radiator of larger size and capacity; larger wheel hub bearings; new design of fenders and a simplification of the control system.

The motor conforms with the standard design for six-cylinder Knight engines. The cylinders are cast in two sets of three each, a practice that dominates six-cylinder design in Europe and permits the use of a seven-bearing crankshaft, precluding any possibility of the crankshaft being distorted under any strain which could be imposed upon it.

Carburetion and ignition are given special attention as to details. In the upper half of the crankcase there are coreways through which air is passed before reaching the carburetor. In addition to eliminating the wheezing sound of air, which is out of place in a silent running car, these coreways also result in the air being heated by its proximity to the oil, which re-

mains hot long after the engine has cooled. Greater ease in starting and additional power when running are thus gained.

The lubrication system consists of movable dams or troughs immediately beneath each connecting rod. They are kept full and overflowing by a gear-driven pump. The rods have scoops which dip into troughs, splashing the oil thoroughly. These troughs are connected to the throttle on the steering wheel so that they may be raised or lowered increasing or reducing the amount of oil they contain, according to the speed of the car, the work it is performing and the position of the throttle.

Refinements of the "48," "38," and "30" consist chiefly of slight changes in details which have been simplified and rendered less in need of attention. New bodies are characterized by extremely fine body work and painting, for both of which the Stoddard-Dayton has earned an enviable reputation. The front seats of the "48" are adjustable forward and back to fit any leg length and the body is built with an unusually wide fore-part to allow plenty of room for the driver. Rubber bumpers on which the bodies rest eliminate squeaks and considerable vibration.

In essentials, the three poppet valve chasses reveal no important changes. Gradual improvement of details has been worked out during the several years in which they have been built and the satisfaction which they have given to owners has proved the soundness of their design.

USE TOO MUCH GASOLINE.

Why Some Get But 15 Miles on a Gallon When They Should Get 25.

"To waste gasoline in operating a car is one of the easiest things in the world," says the manager of the Boston Ford car branch. "To be sure, less can be wasted in a small, light car like the Ford, than in some of the heavier vehicles. But, even so, the consumption of fuel at the rate of say a gallon for each 16 miles, when the same amount of fuel will run the car well over 25 miles, is wastefulness of some magnitude. Still, that is exactly what some owners are doing.

"Let us see how it is that gasoline is 'used' in this careless way. We all know that the more nearly vaporized the fuel in the mixture, the higher will be the pressure in the cylinders, and, therefore, the less the amount of mixture used to accomplish a given result. We also know that heat is the thing that vaporizes the gasoline.

"When starting up in the morning the whole engine is very apt to be cool. It has been found that to open the needle an additional quarter turn or so facilitates starting. Furthermore, it makes the engine run better while it is 'warming up.' But the needle is not always turned back to its best running position after the few minutes of running needed to warm up. There is no question of the efficiency of the additional quarter turn of needle opening when starting and warming up on a cold day.

"This is but another illustration of the usefulness of heat in a carburetor. The colder things are the less rapidly will the gasoline vaporize; so to vaporize enough to permit of running the car, an excess must be supplied—the greater part of which is not used even when it is most necessary, and all of which is wasted when a warm engine makes it unnecessary.

"In Winter and Spring, when the roads are heavy with snow, slush or mud, it takes more power to drive

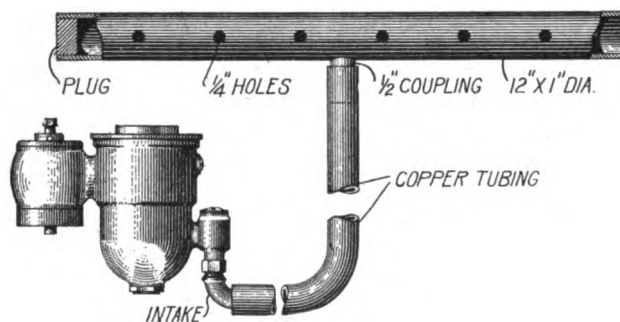
a car at a given speed than it does when running on good, clean, level roads. It also takes considerable more power to drive a car on stormy, windy days than it does on clear, calm days. For this reason, do not expect to make the same mileage over heavy roads as over clear ones and always consider weather conditions when figuring 'miles per gallon.'

"For the purpose of obtaining accurate fuel consumption figures, a well known carburetor was attached to a 1912 Model T Ford and the results were as follows: Without warm air pipe, car covered 26.1 miles on one gallon of gasoline. After attaching air pipe (which leads from the outside of exhaust pipe to carburetor intake) car covered a distance of 31.4 miles on one gallon of gasoline.

"The third test was run with the warm air pipe off and the gasoline needle valve one-quarter turn too far open. The car in this instance covered only 15.8 miles on one gallon. These figures show the large excess of fuel consumed when warm air pipe is not used and carburetor is not properly adjusted. Every Ford Model T owner should obtain between 20 and 25 miles per gallon under average conditions, provided the warm air pipe is used and the carburetor is properly adjusted. The warm air pipe should be removed during hot weather."

A Hot Air Intake.

Dr. W. R. Keeney, Iowa.—I have noticed many inquiries in your magazine regarding Buick 10 cars. I have a Buick 10, '08 car, engine No. 767. I mention this so your readers may know the car is not new. When I purchased this car it was thought to be worn out. The first thing I did was to overhaul the engine and take out



Dr. Keeney's Device.

the carbon. The next thing done was to get a Schebler L carburetor and next a Delco relay. Now for results: I can run this car down to 5 miles on high over dirt roads and can take quite a raise of ground at 6 to 7 miles on high without distressing the engine.

Your readers may wish to know how I accomplished such results. I took a piece of 1 inch gaspipe about 1 foot long, drilled 6 holes, each 1/4 inch, on each side of pipe; I also drilled one hole at about the center large enough to take a 1/2 inch coupling, to which I attached a piece of copper tubing large enough to go over the coupling at the one end, and the other end large enough to go over the air intake of the carburetor. I closed the front end of the gas pipe and clamped the same to exhaust manifold over to end of cylinders. Then placed the copper tubing so that all of the air that passed into the carburetor through the air intake was heated by the manifold.

Results: A smooth running engine which can be throttled down to 5 miles an hour on high, and will also climb any hill in the country, no matter how long or high, on high and will average 25 miles on a gallon of gasoline.

Now part of these results are due to the Delco relay. Anyone who has run a car any length of time knows that to have such results as I have above mentioned, the car can have no missing cylinders; the Delco looks out for that. I will also say in this connection that the car I have has no magneto. I run on dry cells. I have run over 1200 miles on one set of cells and they now test 13.

Aside from one adjustable cone, I was out nothing except for carburetor and Delco, which I think speaks well for a car, remembering this is the fifth year my car has been in use. So let those Buick owners who have trouble get a Schebler L; connect it as I have suggested, and a large part of your troubles will "Fold their tents line the Arabs and silently steal away."

Carburetor Backfiring.

Backfiring in the carburetor is usually due to a choking or want of gasoline mixture in the cylinders, or to poor timing or sticking open of an intake valve. Although it is an uncommon occurrence for valves to stick open, it sometimes occurs as a result of a bent valve stem. Many valve stems have been bent by workmen in prying up the valve spring for the purpose of removing the pin that secures the spring seat to the stem.

When a popping in the carburetor takes place one should examine the valves and see that they are working properly and regularly before tackling the carburetor.

The most common cause of popping or backfiring in the carburetor is that of a weak mixture, due either to water in the carburetor or a shortage in the fuel supply. A weak mixture is a slow burning one, and it generally is claimed that a weak mixture burns so slowly that it is still burning and with some pressure when the inlet valve opens on the following stroke. Some, however, are of the opinion that under ordinary working conditions the mixture in the intake pipe of a motor is not in condition to be explosive; but when it has been starved to a certain extent it becomes explosive and the backfiring takes place, it being maintained that at high speeds there always is a flame in the cylinders, but this flame is not sufficiently hot at the end of the exhaust stroke to ignite the incoming mixture of the next charge except when the previous charge also was a weak and slowburning one.

Paint for Radiators.

When the paint has finally worn off the radiator the painter must not attempt to renew it with the ordinary paint which is used on metal surfaces. The warmth of the radiator will cause the paint to peel off much more quickly than at any other point. Special paint for the radiator may be secured from dealers. A feature which must necessarily be remembered in the painting of radiators is that the paint will not hold well on the smooth surface. The radiator should be first roughened a little with smooth sandpaper. The coats of paint should be very thin, as the thick paint will have a marked tendency to flake off.

How to Blacken Lamps.

Dissolve in 1,000 parts of ammonia water, 45 parts of natural malachite. All the parts to be colored are then thoroughly cleaned, all oil and grease especially being removed from the surface. The solution can be placed in a large pot or other vessel which is big enough to contain all the articles to be blackened. When these are all put into the solution and allowed to stand for a half hour the vessel containing the mix-

ture and parts is then slowly heated, allowing the temperature to rise gradually until all the objects take on the desired depth of color. After this has been secured, the parts are removed, rinsed off and allowed to dry.

Farmers Equal to Emergencies.

In the recent Farm and Ranch endurance run from Dallas, Texas, to San Antonio, Texas, the entrants to which and drivers of cars were exclusively farmers and ranchmen the ingenuity of the men was conspicuously displayed.

A Dallas county farmer, R. G. Roach, lost a wheel because of loose nuts, the wheel flying at a tangent into a corn field and the nuts wherewith to put the wheel on again, lost in the dusty road. Apparently he was a "goner." It was not so, however. He espied a farmer plowing with a cultivator in the field and he remembered quick as a flash that there were bolts on that cultivator of the same size as on the wheel of his automobile. Grabbing his monkey wrench he went to the farmer and asked the loan of four nuts, which was willingly granted. The wheel of the auto was soon repaired and Mr. Roach came into Dallas on schedule time.

Another farmer, B. F. Wilkinson, broke his transmission. He was indeed in a bad fix and most men would have given up in despair; not so with Wilkinson; he had a destination to make within a certain time and he intended to "get there." He searched several telephone poles alongside the road until he ran across an extra piece of guide wire, clipped this off and got to work. His ingenuity and mechanical skill saved him, and he used that farmer-repaired transmission to the end of the trip, a distance of over 200 miles.

W. A. Hamilton of Dallas county was another game one. Having broken his left front spring he got a block of wood and some baling wire at a farm house and made the trip, a distance of 65 miles, in this crippled condition.

Verge Coleman of Kerens broke an axle after leaving San Antonio about 10 miles. A passing auto took him back to that city, where he purchased another axle. The friendly automobilist, a lady by the way, carried him and his axle to the car. Hard luck again overtook him, the axle would not fit because of the grooves, and he patiently filed on those grooves for three hours and put that axle on.

Opposes Four-Speed Gear.

Wm. Guy Wall, chief engineer of the National "40" Company at Indianapolis, who has the distinction of having designed the world's stock champion and international champion cars, goes on record as being opposed to the much-talked of four-speed gear set. He says that if cars are under powered, there might be some excuse for four speeds.

"What one desires in a car is quiet running and simplicity," writes Wall. "Quiet running can be best procured by using direct drive. Simplicity is approached the nearer by using as few a number of gear changes as possible.

"In certain countries abroad where a tax is levied on the horse-power of an engine there is some reason for keeping down the horse power. I have ridden in various cars in foreign countries where it was necessary even on good roads to shift gears from high speed on grades not much over two per cent. The American public does not wish to be continually changing gears."

GOOD FOR THE DOCTOR.

How the Automobile Has Sweetened His Life and Broadened His Usefulness.

Owen John, that bright and witty writer in the *London Autocar*, considers that having tasted the fruit of the tree of better travel even as Adam and Eve tasted the fruit of good and evil in the garden, has wrought something of a change in human habits, and this is the way he rambles and ruminates about it:

This new motoring habit of "no waiting" is having its effect on our national character. May we take it as a fact that the days of hurry and hustle began when motors first arrived, about which time also half-penny morning papers also swept into existence? Some folk look on this "ram you, damn you," modern tendency with never-failing regret, but that is only because they are short-sighted folk and do not see the other side of the question at all. Take the motoring doctor, for instance—and, since doctors have come into the limelight of late with a vengeance, let us consider his change. "Ah," say the old-fashioned, "where is my top-hatted, austere, bird's-eye-tied, black-coated, be-whiskered medical adviser, where are his pill box—I mean brougham—his well-known horses, his dignified coachman, his appetite for sherry, and his company at lunch? Gone! All gone! And in their stead has come an ordinary—or extraordinary—human being, with a cap on, in tweeds, with a crash coat, leather gauntlets, and a habit of never moving out of a run. He comes, he sees, and he departs. We are, it must be confessed, just as healthy as we used to be, and also he seems more human and less reserved. But it does not seem the same at all. We dislike this rush, this hurry, and, as for his partner, who makes us shudder with what he calls his 'motor bike,' Heaven preserve us!"

But then comes sickness or some ailment or incident that needs constant medical presence, such as a modern nurse who will try experiments on her own and "knows too much about doctors." Then the old-fashioned begin to learn the value of motors and telephones, of a machine that is always in harness, of the seven miles covered in the quarter of an hour, of the value of a means of conveyance that doesn't keep the stables up all night, and they acknowledge there is something in it for doctors, the very class that they were lamenting the decadence of. Look at cars from the country doctor's point of view.

Instead of the weary six miles an hour or less of a hilly country, instead of the interminable jog-jogging along the dull level—we used to call the family physician "Three-ha'pence and tuppence" when I was a little boy—instead of the bucolic conversation of our coachman, we get the hill it is a pleasure to climb, the dip it is a joy to rush, the level straight that is no sooner seen that it is behind us, and always the cheerful hum of a good and well-cared for engine. Rounds have become a joy instead of a drudge. Also the night calls, for now, instead of the rousing of the sleepy man, the harnessing of the horse—O, the lantern that will not burn, the noise of the hoofs on the wet stones, the dirty buckles, the scrunching of iron wheels against the coach-house wall—and the dreary trot of a tired and half-wakened beast through muddy streets, all that is needed is the switching on the electric head lights in the well-warmed motor house, a turn of the handle, and the car off rejoicing in the wide, empty roads, racing its own shadows, and playing with the rabbits and hares that look on the world as their

own between the midnight and the dawn. Even the fact that help and the doctor have come so wonderfully soon makes the patient better and cheers anxious friends, who know that the man who makes the resources of civilization his own in one way is the man who knows how best to use the wonders of modern surgery and medicine.

So much for the doctor's work, now for his play. When horses were the only wear, to be a successful doctor meant to be away or at business all the day, for rounds in the country were long and tiresome, horses wanted rest and baiting, and daylight in the autumn and winter is a short thing. So in those days for a doctor to hunt or shoot was a sign of independent means or insufficient practice. But now he can do his work and hunt and shoot, or play golf and cricket with the idlest of the rich, his body and his mind are the better for it, or, if he is domestic or a student, he can spend the unemployed hours of the day at the home which in the old days he knew as little of as the commercial traveller does of his children.

USES BOTH FUELS.

A New Carburetor Which Combines Kerosene and Gasoline and How It Works.

Although attempts have been made in this country to use kerosene for fuel, in place of gasoline, for some reason not fully comprehensible to the ordinary mind, it has never been successful enough to be applied to any great extent. In England, however, a carburetor has been invented which burns gasoline and kerosene combined. It is called the Hamilton Bi-fuel Carburetor. The illustration given herewith indicates how it works. Of course, the engine has to be started on gasoline alone but it continues to run on the fuel mixed in proportions best adapted to the purpose, 60 per cent. kerosene and 40 per cent. gasoline giving the best results.

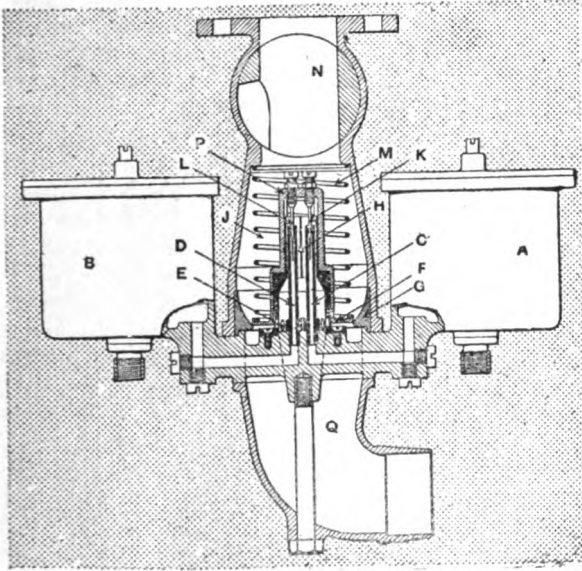
The use of mixed fuel supply in the bi-fuel device depends essentially on a nice relative adjustment of the jets for the two fuels, and the maintaining of a constant suction on those jets, while incidentally the means taken to this end ensure a supply of air adjusted to the requirements of different engine speeds.

The carburetor comprises two float chambers A and B, one for each sort of fuel, and with each of these float chambers is associated a separate jet, as seen in the sectional drawing. At the base of the mixing chamber is the air inlet, which practically forms a ring round the two jets, and it will be noticed that when the air valve F between this inlet and the mixing chamber is shut, only a comparatively restricted air flow can pass to the engine. This it has to do through the ports E, so that all the air used has to pass up the choke tube H. The seating G, on which the air valve F is pressed by a helical spring M, is formed in the lower part of the chamber J. It will be noticed that the seating G of the valve F is curved and shaped in such a way as to graduate the flow of air between it and the air valve, as the latter rises under the increasing suction of rising engine speed, in such proportion to the travel of the valve that the negative pressure in the mixing chamber J remains practically constant.

But the air valve consists of something more than a mere flat annulus, for it is carried upwards to form a bridge piece P above the choke tube of the jets, and in this bridge piece the needle valves K and L are held in such a position as to regulate the flow of fuel through the two jets. Moreover, as they screw into the bridge

piece and are held by small lock nuts, their position is adjustable, so that the flow of fuel in either jet can be relatively adjusted to requirements.

The working of this carburetor can hardly be better explained than by describing the method of adjustment. In the first place, of course, the cross-sectional areas of the two fuel jets are so proportioned as to give in general terms the required relative flow of the two sorts of fuel. The needle valves are fitted to the bridge, and, with the main air valve shut, the needle controlling the kerosene jet is screwed down until it entirely shuts off all flow of kerosene, while the needle regulating the gasoline orifice is adjusted to allow the passage of just sufficient gasoline to carburete the air capable of passing up the choke tube H. Under these conditions it is practically as though



The Bi-Fuel Carburetor. Part sectional view showing the arrangement of the jets and their respective needle valves.

- | | |
|--|--|
| A, kerosene float chamber. | H, choke tube containing the two jets. |
| B, gasoline float chamber. | J, mixing chamber. |
| C, kerosene jet. | K, needle valve of kerosene jet. |
| D, gasoline jet. | L, needle valve of gasoline jet. |
| E, fixed air inlet ports for slow running on gasoline. | M, automatic air valve spring. |
| F, automatic additional air valve. | N, throttle valve. |
| G, shaped seating for air valve. | P, bridge carrying needle valves. |
| | Q, hot air inlet. |

the engine were running on a pilot jet, for the supply is sufficient for slow running with no load or starting from cold. Directly the throttle is opened up, however, and the engine speed increases the additional suction raises the air valve F, which thus automatically has the effect of increasing the gasoline orifice and opening up the kerosene jet in its rise. In this way the engine, started on gasoline, is able to continue to run on the fuel mixed in proportions decided by the respective areas of the two nozzles.

Irregular Firing.

When one cylinder alone loses power it may often be traced to the spark plugs, especially if they are of different makes and the points are of variable distances apart. The current may be of sufficient strength to jump across the points which are not over 1-64 inch apart, but those too far apart offer so much resistance that the spark is diminished.

It seems reasonable to believe that the use of one make of plugs in all the cylinders of a motor at one time would be most practicable, inasmuch as they would be most apt to promote more uniform firing, owing to their similarity of construction. It is possible, however, to adjust almost any combination of different makes of spark plugs so that no difference in the regularity could be detected.

AIR PROPELLED CARS.

Their Advantages and Why They Are Not Yet of Practical Use.

The possibility of driving by means of an air propeller has again been demonstrated by a long-distance run of a car so driven in France, and, seriously considered, the possibility of this means of drive (after the first disadvantages have been put out of consideration) is apparent, and real advantage is acknowledged to be derived from propulsion of this type.

The air-propelled car is simply an engine on four wheels, a body, a wooden propeller, and just one extra—a throttle lever. The car is minus clutch, gearbox, differentials, bevel gear or worm gear, radius rods, speed levers, and other essentials in the gasoline or electric motor car.

In a recent test on the Brooklands track in England an air-propelled car traveled at the rate of fifty-nine miles an hour, while the complete absence of vibration and the gondola-like gliding came as a revelation to the experts who rode in the car.

It is admitted that there are serious disadvantages to the air-propelled car. That it is revolutionary would cause many to condemn it. It renders body design difficult in the case of a limousine or any closed car, while the dust problem when starting and the necessity for inclosing the propeller are arguments advanced against the general adoption of the "wind wagon." In describing the machine an English automobile expert says:

"Probably the greatest drawback is the position of the air propeller. The propeller could not, without inconvenience to passengers, be situated in front of the car, as the draught when the car is stationary is prohibitive.

"If it were at the rear the body would have to be tapered, in which case the propeller shaft could be inclined slightly upward, so that the troublesome propeller blast would be brought to a minimum. It should be remembered that this blast occurs only when starting, and would hardly be noticed when traveling.

"The propeller would have to be efficiently guarded to prevent accident, both to itself or to any inquisitive person. In the former case stones flung up from the wheels would be the greater source of trouble.

"There is still the problem of reversing that upsets slightly the claim for absence of gearing. There is also the fact that the present day trend is toward higher speed engines, and from this it appears that some simple form of gearing would have to be interposed which could meet these contingencies.

"Probably the simplest arrangement of drive would be a long, straight shaft from the engine to the rear of the car with some form of chain drive up to the propeller, and the latter would have to be situated some distance above the ground on account of the size.

"The average small car of about 12 h.p. would probably require a propeller of something like four feet in diameter, and larger powers in proportion. Four-bladed propellers could be used to reduce this diameter.

"The advantages of this form of drive are numerous. Perhaps the most important would be the enormous decrease in the tire bill, as the tires would all be as front wheels. In fact, the wear and tear on the rear tires would be much less than on the front tires, because the front tires carry more weight and have to turn the car in answer to the steering.

"The decrease in cost of production would be very

considerable, and the maintenance of such a car would surely be small. The total weight of the car would also be very low, there being practically only an engine and frame, and this would decrease the weight of wheels, axles and tires.

"Change-speed gearing would be superfluous; in fact, it would be worse than useless, as the propeller is an automatic, infinitely variable clutch which suits itself accurately to all loads. It exerts an enormous thrust when the car is starting or hill climbing, and automatically applies a braking effect when going down hill at a higher speed than its pitch speed. As a matter of fact, it is converted into a windmill whose power is absorbed in turning the engine round.

"The car could be brought to rest in a shorter distance than the usual type of car, because, besides the brakes, which in any car can only be applied to the point of locking the wheels, the propeller could be reversed and would be an entirely outside force of some hundreds of pounds dragging on the back of the car.

"Skidding on greasy roads would be almost unknown, as there would be practically no dead weight on the back of the car and no drive through the tires to aggravate a skid. There would be a slightly downward push from the propeller, according to its angle, which would make the wheels grip the road, but which, unlike dead weight, would not be capable of exerting centrifugal (or skidding) force when turning.

"As far as absence of vibration and gentle acceleration is concerned, the writer, who has with a few friends, probably traveled the longest distance by road in this country on a propeller-driven car (i. e., Southampton to Weybridge), can vouch for this.

"Propeller drive ought to be especially suitable for cycle cars where minimum weight and small cost of production are predominant factors in the design."

But there is another and a far more important side to this matter of air propellers as power. At 1,300 revolutions per minute, this propeller gives approximately 400 lbs. static or stationary thrust. When the machine is travelling forward at 30 m.p.h. the thrust is 200 lbs., at 40 m.p.h. 140 lbs., at 50 m.p.h. 60 lbs., at 60 m.p.h. 20 lbs. These figures are, of course, merely approximate, but they may be taken as fairly accurate.

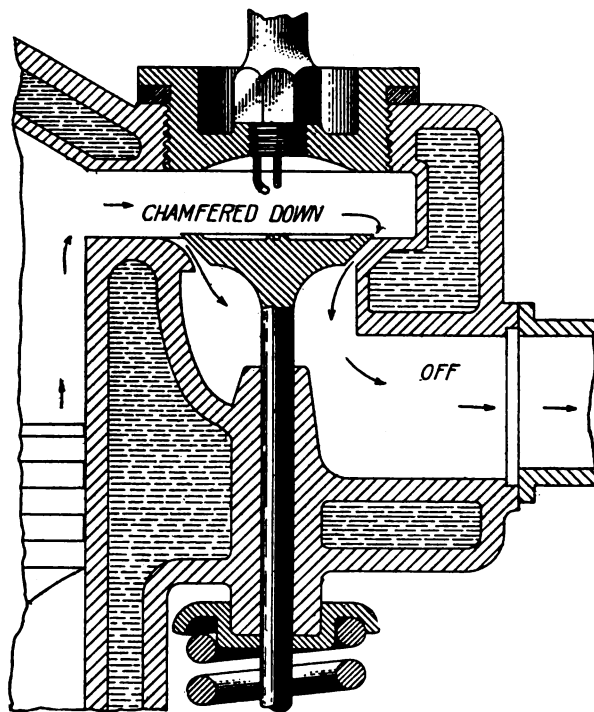
Let us now consider this power plant fixed on to a "wind wagon" so as to make an air-propelled car. The first thing which deserves attention is the fact that such a vehicle could only be run on an absolutely deserted road on account of the diameter of the propeller, which is slightly over 8ft.; in other words, the tips of the blades would overlap a very wide motor car by some 15 inches on each side. This is, of course, a very serious matter; indeed, perhaps it is the most serious obstacle to the coming of the air-propelled car, because to attain efficiency, propeller diameter is one of the most important factors, if not the most important.

Another serious point against the air-propelled car, is the extent to which it is affected by wind, and in this connection it is almost needless to say that it cuts a poor figure beside its positively driven rival. The maximum speed of an air-propelled car is, let us suppose, 50 m. p. h. Against a head wind of 20 m. p. h., a thing which is very commonly met with, its maximum speed is reduced to 30 m. p. h., whilst, of course, a wind of 50 m. p. h. holds it absolutely stationary. On the other hand, with the wind behind, its speed is increased by the speed of the wind. It is hardly too much to say that this fact alone is almost

sufficient to condemn the idea completely. Of course, it means that one's average speed is at the mercy of weather conditions, whereas with the ordinary car the effect of wind is much less pronounced.

A Cause of Pre-ignition.

It has been found that pre-ignition will occur in a motor if some part of the metal heats to a point above 600 degrees, no matter if some of the metal is cool. Under normal conditions a small zone in the center of the piston head is the most likely to cause pre-ignition, and in a motor that has been operated for some time this will give trouble either within the combustion chamber or upon the surfaces of the top of the cylinder. If the heat cannot get out after it penetrates the surfaces of metal of the cylinder it will pile up and there will be a transfer of heat from the metal heated walls of the cylinder to



Section of a Cylinder.

the un-waterjacketed head of the piston. It is thus not unreasonable to expect that a small portion of the middle of the piston head will reach a dull red heat, and this is sure to cause pre-ignition when the compression is above forty pounds to the square inch. If the motor is clean and pre-ignition occurs it will be a wise precaution to unscrew the valve covers, as shown in the illustration, and if the valve has burrowed itself into the metal of the seat sufficiently to form a sharp edge, the seat should be chamfered down so as to remove the ridge.

Truck Business Growth.

The growth of the motor truck business is assuming tremendous proportions. At present 260 concerns are making motor trucks, and new names are being added to the list every day.

There is hardly a line of merchandising which requires draying of any kind that is not adopting the motor truck, to say nothing about the omnibus lines that are being established throughout the country.

The following list shows by what lines of business the motor truck is being mostly used and the number of cars in use:

Express and transfer companies	2,615
Breweries	2,548
Department stores	2,403
Sightseeing and omnibus lines	1,060
Gas and electric companies	1,320
General manufacturing companies	1,320
Fire apparatus	1,260

The total value of trucks in the United States is \$64,800,000. The annual operating expenses are \$113,400,000. The chauffeur wage is \$28,300,000. They give employment to 5,000 garage men. The annual insurance is \$5,300,000, and the annual tire cost is about \$12,500,000.

One expert says that the cost of maintaining 60,000 horses would be \$135,000,000. This would mean a saving of \$11,000,000 per annum in favor of the motor truck.

The following list gives the number of trucks in use in six of the largest cities in the United States.

Greater New York	4,060
Chicago	1,800
Boston	900
Los Angeles	760
Detroit	400

Twenty-five of the largest cities show a total of 11,270 trucks, an increase of 75 per cent. since September 1, 1911.

LEST WE FORGET.

How Being Absent-Minded Is a Prolific Cause of Automobile Troubles.

From Gas Power.—Gas engine operators have always had troubles of their own, but as the industry increases and improves now, troubles arise to annoy the ambitious attendant. There is one cause of trouble, however, that has always had a prominent place; in fact, we might say that it stood, and yet stands, at the head of all others in the trouble category, and that is the absent-mindedness of the operator. How often do we see an automobile operator make one, two or three trips from the starting crank around to the steering bar of his machine, before he finally succeeds in starting the motor.

Little does the onlooker realize that practically all of these manoeuvres are necessary by reason of the absent-mindedness of the operator.

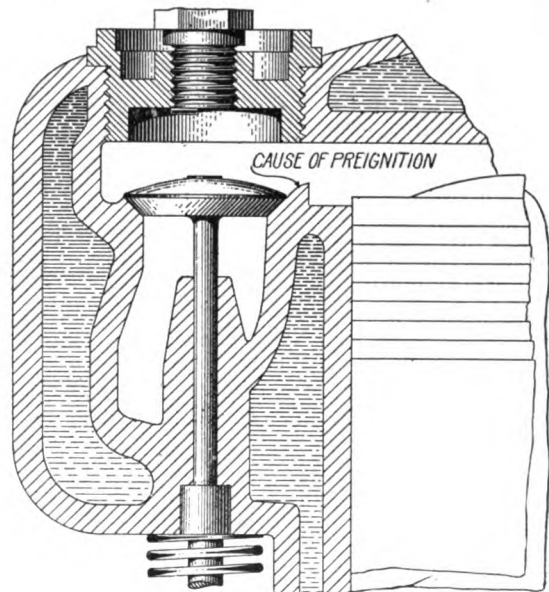
One thing, however, the average person may notice not unfrequently, and that is, that the operator will get in and take his seat at the wheel before he realizes that his motor is not running. Then, becoming self conscious, and feeling that everyone has seen his act of absent mindedness, he jumps excitedly out of his automobile, steps briskly around to the front end and takes hold of the crank and turns vigorously, but the familiar chit-a-chit does not greet his ears. With a hot flash in his face, an aching muscle in his arm, he steps back and leans over into the car at the steering bar and there he finds that he failed to throw in his switch. This he does and goes back to his crank in confidence, but after another siege of turning, the motor fails to mote, and he makes a second trip to the steering wheel, looking very much worried. This time, he notices that he had neglected to open the throttle and that the carburetor nozzle was entirely closed. He adjusts the throttle lever and again goes around to the crank. This time, unexpectedly, the motor gets a preignition and forces the crank out of his hand and in the back last comes around and gives him a sharp rap on the knuckles. Then he realizes that he neglected to detard the spark. Another

trip to the steering wheel to adjust the spark, and this time at the crank starts the motor, but the operator, very hot and irritated, gets into his seat at the wheel and in his anxiety to get away from his amused and interested crowds he forced his foot onto the pedal and shoots his car forward on a jump, narrowly averting the complete shutting down—"killing"—of his engine, and in his impatience probably collides with some delivery wagon or other vehicle on the street. All this trouble is the result of thoughtlessness, carelessness or absentmindedness.

The average onlooker may not know what may be the real cause of such troubles, but about every operator can recall a time when he was face to face with similar conditions and incidents, which make him feel like "thirty cents." When the spectators to such incidents are a rod or two away, they usually conclude that the motor has a stubborn spell and are ready to praise the operator and call him a "smart fellow" for being able to finally conquer it. I've had it "handed" to me that way, but say; the intended compliment had lost its gratifying peacefulness, and I did not "swell up" like a "pizened pup" on account of merited laudation.

Result of the Defect of a Motor Casting.

Sometimes pre-ignition occurs in a new motor and in such an event there is almost a certainty of some fault in the design. The illustration shows a condition that



Showing a Projection.

will produce pre-ignition caused by projecting sharp edge of the part that forms the seat of the valve. In some motors the valve seat is re-inforced by a boss that is made by putting a loose piece on the pattern when it goes into the sand in the foundry and this loose piece is liable to slip out of place during the pouring of the metal so that in the finishing of the valve seat when the motor is being made the projection is left and the sharp edges of the thinned out metal remain. There are other instances of pre-ignition owing to some defect of the casting or design and the proper remedy is to remove the cylinders from the motor as soon as this occurs, and if there are any protuberances they should be chiseled or filed off for the motor will not run satisfactorily until this is done.

Automobile Dealer and Repairer

A Magazine of condensed and compact information for busy readers.

PUBLISHED THE MIDDLE OF EACH MONTH BY

THE MOTOR VEHICLE PUBLISHING CO.

71-73 Murray Street, New York

Telephone, 6765 Barclay

Post Office Box, 654

Entered as second-class matter at the Post Office in New York City.

M. T. RICHARDSON, President and Treasurer.

A. A. HILL, Editor.

F. R. WHITTEN, Secretary and Advertising Manager.

TERMS OF SUBSCRIPTION.

One Copy, One Year, Including Postage.....\$1.00
One Copy, Six Months.....60 cents
Single Number.....10 cents
Foreign Subscriptions.....\$1.50, or 6s. 3d.

Remittances should be made by Express Money Order, Draft, Post Office Order, or Registered Letter. Foreign remittances, where possible, by International Money Order.

ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, SEPTEMBER, 1912.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

THE PRESENT NEED.

Now that the automobile of moderate price has become a standard vehicle of travel, and the commercial car is rapidly displacing the horse-driven wagon, manufacturers have the opportunity to turn their attention to a car that will eventually be more commonly used than any other vehicle of travel ever has been. The need is for a low priced and simple car that the man of moderate means, or even the ordinary day working man, can afford to purchase, and what is more important yet, to run without impoverishing himself.

We are inclined to think that this car may not be a four-wheeled one and possibly not even a three-wheeled one although, of course, it is worth something to have a vehicle that will retain its equilibrium and not fall over when stopped or be dangerous when traveling over rough highways. A two-wheeled car, however, can be constructed at a much less cost and can be run with far less expense for fuel, tires and lubricants.

A vehicle of this kind that can carry comfortably two persons and that can be sold for two or three hundred dollars would be an especially attractive one to offer the man of small means. Moreover, a car of this kind might be housed easily and with far less expense than the ordinary automobile which must be kept in a garage. The subject is worth the attention of those manufacturers who have already made a success with medium priced cars.

There is undoubtedly a distinct turning away from the ultra high priced car to a cheaper high grade car. At least three of the highest-priced automobile concerns in the country have found it rather slow sailing this past year, and are making a less expensive type of car which they are selling at about \$2,000 less than their big cars, which they formerly made exclusively. Among the high-priced auto makers there is every-

where striking evidence that the turn in the road has come and their splendid factory organizations are devising models to satisfy the public demand for a high-grade car that does not sell at over \$3,000.

This is all well enough in its way, but there are comparatively few who can afford to pay \$3,000 for a car who cannot afford to pay \$4,000 or \$5,000. But there are thousands to one of these who can afford a car that costs little to run and store, but who cannot afford a horse and carriage for the mixed use of business and pleasure. A two-wheeled vehicle admirably fills the requirements of low cost of propulsion and tires, but whether such a vehicle can be made to carry two persons comfortably and safely and quietly is another matter.

BUSINESS ETHICS.

Not long ago the manufacturer of a certain automobile accessory took a contract to supply a well-known car manufacturer with some of his product, and by some mistake in figuring or the necessity of making the goods in a more expensive way than at first contemplated, he found that filling the contract meant either an actual loss or absolutely no profit.

When the car manufacturer learned this, he insisted upon paying more for the accessories so that the producer would make a fair profit. A case of this kind is so rare in business that it deserves being put on record.

It used to be considered a compliment to say of a man, "he always does as he agrees." But such an interpretation of the act arises only when business ethics are on rather a low plane. No one deserves any credit for being honest, or for doing just as he agrees to do. But when he does more than he agrees to, it is certainly worth a few words of commendation, for if the feeling to be absolutely fair were pervasive most of the economic problems of the day would be far nearer solution.

Although we have no reason or theory to account for it, this feeling of doing the right thing whether it be "denominated in the bond" or not, seems to exist in the automobile business to a marked degree. Business ethics and business courtesy are apparent all through it.

FOR TRAVEL ONLY.

The other day a car was seen standing on a much traveled macadam and well oiled New Jersey road. It occupied about one-half the highway and the owner was stopping to make some tire or other mechanical adjustment. It had been raining not long before and the surface of the road was slippery as well as pretty well convexed. There was room for passing cars, but to do so they were obliged to steer well into the slanting ditch, and in some cases, depending of course, as much as anything, upon the speed of the car, the rear wheels skidded or swerved so dangerously that it was expected they would overturn or strike the trunk of a good sized tree in the ditch. In one or two instances a rear wheel missed the tree trunk by not more than a few inches.

The incident is suggestive of two points: When stopping a car for any length of time for repair purposes or adjustments it is not enough that one-half only of the highway be occupied; the roads are designed for driving only. No one has any right to occupy them or any part of them for any other purpose. When obliged to stop the car, turn well into the ditch.

Give other drivers so much of the road so that in passing they need make no deflection whatever. Otherwise in case of an accident a court of law would clearly place the entire blame upon the standing car, and for the reason stated, namely: The highways or any part of them cannot be legally used except for travel.

A POTENTIAL VIEW.

If the automobile-using public will not be satisfied with nothing less than railway speed, then as a finality we must have railway conditions—steel rails, graded roads, the track raised on the outside of curves, hills cut away, valleys filled, and private roads where no one or thing has any right but automobiles.

And in the case of the railway train, the propelling power is a carriage by itself and is not thus added to the weight of the passenger car, the automobile being the only vehicle that carries its own propelling power. If the horse-drawn vehicle, for illustration, had to carry the horse, just as the automobile must carry the motor and everything else that relates to the propelling power, it would be necessary to make it about ten times as strong and heavy, especially if the horse were expected to go 50 miles an hour.

Possibly it might be practical to make an automobile with the motor ahead and the carriage for passengers trailing on behind. Or, better yet, attach the motor to the rear and have it push the car before it. Surely, a car to carry passengers only might be made extremely light and thus easy to ride in and propel, but just what size, shape and weight would be necessary for the motor is altogether another question and one that might sorely puzzle engineers. At all events, the idea is not less vagarious or absurd than some of the automobile inventions set forth in the Patent Office Gazette.

But this is getting away from the question of speed on the public highway, which has as yet not been settled with a proper consideration for not only other users of the highway but for those who wish to drive rationally and yet have a right to be protected from the menace of the reckless, the vicious and the ignorant.

A SIGNIFICANT TENDENCY.

For the last ten or fifteen years the public mind has had some marvellously interesting incidents and movements to witness and reflect upon, but possibly nothing more so than the tendency that has been so rapidly growing to reconsider the ethical relations of man to his brother man.

The whole civilized world seems to have awakened to a re-examination of the old, old question, so often forgotten in business and social life, "Am I my brother's keeper?" and no one can now doubt but that the final answer will be in the affirmative.

Just before the period mentioned, wealth and special privilege seemed to be running riot. Not in modern times had riches been a greater source of power or commanded higher adulation; not in modern times had poverty been held in greater contempt. But the change in public feeling came with forceful and almost startling rapidity.

As the writer recalls it, the first evidence of this change was brought to public attention some sixteen years ago by the well-known phrase of a candidate for President of the United States, who charged that the dollar was being placed before the man. Subse-

quently it was taken up and exploited with varying degrees of reason and justice—and in some instances with varying degrees of a lack of them—in the so-called "muck-raking" magazines.

Soon it entered the dramatic field. "The Passing of the Third Floor Back," and "The Servant in the House," are conspicuous examples of successful ethical teaching on the stage, which ten years before that period would have been signal failures. The phrase "tainted money" was raised about that time as was the question of political contributions, both being matters that would have been considered nonsensical and ridiculous a decade earlier. Thus illustrations of the change in public feeling concerning the just relations of men with each other might be greatly multiplied.

Nor has there ever been another period when such close scrutiny was made as to what keeps some persons poor and what has made others rich. And the answer to this question in many cases, it must be admitted, tends to make the poor man more proud of his poverty than the rich man of his wealth, and the rich man more justly ashamed of his wealth than the poor man now unjustly ashamed of his poverty.

It is not the intention of this magazine to raise questions of religion or politics, much less to take sides concerning them, but it is its duty to point to this remarkable tendency as worthy the careful consideration of those who indulge in the luxury of thought, and to express the hope that it will be finally settled upon the solid foundation of reason and justice, uninfluenced by either thoughtless clamor or narrow selfishness.

MAGNITUDE OF THE BUSINESS.

The automobile business of the United States has been so highly and so quickly developed in comparison with that of other countries that for the fiscal year of 1912, which ended July 1, we exported \$30,000,000 worth of cars and accessories.

The export price of American automobiles in 1912 averaged less than in any earlier year in the history of the export trade, it being \$990 each, against \$1,100 in 1911, \$1,380 in 1910, \$1,700 in 1909, and \$1,880 in 1908.

On the other hand the automobiles imported amounted to but about two million dollars in value, against more than four millions in 1907.

The average import value of the automobiles brought into the country last year was \$2,216 each, against \$2,138 in 1911, \$1,936 in 1910, \$1,788 in 1909, and \$2,392 in 1908. Thus the export price of American machines has fallen from \$1,880 in 1908 to \$990 in 1912.

But the remarkable growth in the exports of American automobiles has not kept pace with the growth in production, since the census of 1900 showed the value of automobiles manufactured in the United States in 1899 at \$4,748,000, while that of 1910 showed \$249,202,000 as the value manufactured in 1909. The wages paid in the automobile industry, as shown by the Census report, aggregated \$1,321,000 in 1899 and \$48,694,000 in 1909; the capital employed in the industry in 1899, \$5,769,000 and in 1909, \$173,837,000; and the number of wage earners employed, in 1899, 2,241, and in 1909, 75,721.

Nothing in history in the way of an industry shows a more marvelous growth than this. At the present time it is safe to say that the capital employed in it exceeds \$200,000,000.

Looking at the matter another way, it is interesting to note that at a recent conference of manufacturers

and railroad men held in Detroit, it was said that 102,000 freight cars will be needed for the shipment of the output from that city. As may be imagined it is no easy matter to arrange for transportation of this magnitude. The call is for at least 2,000 freight cars a week. Just how they can get them in and out of the city as wanted is something of a problem. Automobile agencies will be obliged to co-operate in order to make the service efficient. Of course, Detroit leads in the manufacture of automobiles but it does not make them all by any means. There are a good many made in cities in Ohio, New York and Pennsylvania.

It is fair to attribute to this wonderful industry a large share of the country's present prosperity.

THE FACTS ABOUT IT.

Now that we are beginning to have quite a success in selling a certain kind of American automobiles in foreign markets, the old, old bird-witted question is being asked: "Why should there be a tariff on automobiles when we can sell abroad in competition with their cars?" To the individual who has never given the matter any thought or attention, the question seems pertinent, but it is not, and for these reasons:

1—We can't sell cars of the same kind and quality as cheaply as European cars can be sold for. 2—If it had not been for the tariff we would not have been making cars in this country. 3—We make a certain quality of cars, and mostly by machinery; they are mighty good cars; abroad they have not yet adopted machine methods as much as in this country, and simply because cheap labor does not furnish the same incentive to adopt machine methods as high priced labor does. 4—But they are already awaking to the "American invasion" and they will soon adopt our methods of machine construction. 5—If the tariff were taken off they would at once copy our cars and methods and lay down cars in this country at prices with which it would be impossible for our home manufacturers to compete unless wages were reduced to the European level.

ACCIDENTS.

Our readers often send to us accounts of accidents occurring in various parts of the country. Although we very much appreciate this friendly spirit, it may be stated that we are unable to use one out of twenty of those sent in from our usual sources of supply. In one instance, a reader sends us several interesting accounts of accidents resulting from careless driving but unfortunately he does not state where these accidents occurred. It will be noticed by reading this department, that although the names of the persons injured are not given, the locality is stated and this is done more for identification than anything else. Possibly it might be just as well to leave out this detail but as it was originally adopted we will not change it for the present.

AN AGENT OF PROSPERITY.

On another page of this issue will be found a statement showing that the advent of the automobile has hurt the millinery trade, the diamond trade, the theatre trade, the big city hotel trade, and it is also responsible for the high cost of foot wear.

Quite likely this is to a certain extent true. But it has greatly benefited the iron and steel trade, the rubber trade, the leather trade, the paint and varnish trade, the lubricant trade, the gasoline trade, the hard-

wood trade, the aluminum trade, and the lamp trade.

Moreover, it has benefited the trades last mentioned more than it has injured the others. The automobile has wrought decided economic changes, but on the whole it has been the greatest spur to the country's prosperity of any new industry since the advent of the railway locomotive or the steamboat.

THE USE OF KEROSENE.

The waning popularity of the steam car may possibly be checked by the invention of a burner for that car that will use kerosene for fuel, especially as the increased cost of gasoline is giving some uneasiness in this country and positive alarm in Europe.

Kerosene burners have already been invented and are in use on steam cars, but they are not, we understand, in every way satisfactory, yet one has just been brought out in England that is said to be all that can be desired. Of course the fuel bill is not by any means the main expense of running a gasoline car, but in the case of the steam car it is one of the chief items of upkeep. If fuel continues to rise in price it will soon be a serious expense in the upkeep of the gasoline car.

It is also worthy of note that bi-fuel devices are now being tried upon gasoline cars, a carburetor of that style being mentioned on another page in this issue. We can see no reason why something of this sort might not be successful. The main requirement is to use gasoline for starting. After the start has been made it has been shown by experiments that kerosene gives more power, with identical carburetion conditions, than gasoline.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

The roll of automobile accidents is a long one this month and some of them are particularly horrifying. It is noticeable that many fatalities occurred, and they were usually of a serious nature, owing to carelessness when two cars approached each other. Accidents from this cause seem to be increasing rapidly. In most cases of course the blame is attached to one party only. No matter how careful a driver may be, he cannot always protect himself from the carelessness of someone else. About the only way to secure a fair degree of immunity from danger is to assume that the oncoming car is totally oblivious or unconcerned and will not turn out sufficiently to give another car room to pass. There were likewise a good many accidents reported which were due to grade crossings. Reference has before been made to each of these elements of danger and they are repeated now simply to emphasize it, if possible.

Begged Husband to Shoot Her.—At Petaluma, Cal., while driving at a good speed, a car containing a man and his wife ran into a ditch and overturned. The man and wife were both pinned under the car. The wife was helpless, but the man could reach his horn with one hand. Helpless to aid his dying wife, he lay beside her and honked, honked, honked for help. A farmer heard the sound and investigated. The car was a heavy one, and he ran to his barn and fetched a small jack. It lifted the car far enough to drag out the woman but not her husband. Back went the farmer for help, and finally freed the man. The wife was suffering horribly. She begged her husband to shoot her, and, when he would not, clutched at his

revolver. He withdrew it from her reach, and, in a few minutes more, she died. The husband will live. His injuries are painful, but not dangerous.

Burned to Death Under a Car.—A woman and a man were riding in a car near Patchogue, L. I., N. Y., when, from some unexplainable reason, the car overturned and the driver was pinned underneath. The woman was uninjured and she hastened to try to free the man. His head was clear of the car and so were his hands and feet and she tried in vain to pull him from beneath the machine. Suddenly the gasoline tank exploded and enveloped the car in flames. The woman still thought she had a chance of saving the man's life but he told her it was no use. "You can't help me," he said. "I have got to die here and if you don't get back from here you will be burned to death too." His last words were a message to his wife to the effect that he had left her well provided for and was insured for \$25,000. The woman was an intimate friend of his wife's and was on her way to visit the family when the shocking accident occurred.

What A Girl Did on Broadway.—A racing car driven by a girl on Broadway, New York, had a brain storm, so to speak. Although she was driving, a man was in the car, but he seemed to have perfect confidence in her ability. To avoid running down a taxicab the girl swerved to the right, knocked over a man who was standing on the corner, upset a news stand and scattered the papers and magazines in all directions, knocked off the corner of a building and broke the window, and finally ran its speed out and was taken in hand by a policeman. None of the parties would give their names and the man who was knocked down refused to make a complaint. "I want to get home," he said. "This is my first visit to this town and my last."

Seven Persons Badly Injured.—Near Boone, Iowa, seven persons met with a serious accident in which all were injured. Owing to the sloping condition of the road, the car started to slip. The driver turned the steering wheel so as to take the center of the road, but owing to its rough condition he was unable to hold the car as he was going about twenty miles an hour. This threw the car upon the other slope of the road and it turned over completely. There were a good many broken bones and bruises but no lives were lost.

An Oiled Road and the Result of It.—A young woman who owns a millinery store in North Carolina was killed and her two companions severely injured when their automobile overturned at the approach to a bridge near Rye Beach, N. Y. The car was being driven at a high rate of speed, and as it was turned sharply on nearing the bridge, the wheels failed to take hold of the newly-oiled and slippery road. One of the skidding tires was torn off and the car turned a complete somersault. It landed with the back of the rear seat on the road, the hood of the engine resting on a stone wall. The driver was thrown clear of the car but the three passengers were lying underneath, one dead and two others unconscious by the side of her body.

The Car Upset and Three were Killed.—A car driven by a careful chauffeur, in which were four passengers, was upset while passing through Flemington, N. J. It was running along a narrow piece of road when an automobile coming behind them signalled that it wished to pass. Accordingly the car was turned one side to give them room when the car in the rear shot around at a rapid rate and struck the

left front wheel with such force that it ran up a roadside bank and overturned. Three persons, including the chauffeur, were crushed under its weight. They met instant death. The two young women in the rear seat escaped practically uninjured.

Brakes Fail to Hold.—Near Penn Yan, N. Y., a car with four passengers was coming down a steep hill when the brakes failed to hold and it got beyond control, crashing into an embankment. The shock was sufficient to break the leg of one woman in two places while the other passengers were severely cut and bruised.

Killed by an Automobile Lamp.—Near Borden-town, N. J., during an evening a car was traveling at a pretty good rate, when suddenly the driver saw a man a few yards ahead of him. He tried to turn out of the way but it was impossible to do so quick enough, and one of the lamps struck the man. He was thrown some distance, the car was stopped and the man was taken into it, thinking that life still existed. He soon died, however. The driver of the car was very much affected over the death of the man and said he would never forget the accident.

Killed While Cranking.—A New York chauffeur was crushed to death by an automobile truck he was cranking in the garage. The car was standing on the floor at a steep incline when it unexpectedly started forward. He was unable to get out of the way and was jammed against another truck. The man was killed almost instantly.

A Bride of Two Months Killed.—Near Salem, N. Y., a young woman was instantly killed when a car driven by her husband suddenly left the highway and smashed itself to pieces against a tree at the roadside. The victim was hurled violently forward and her head struck heavily against a tree. She was killed almost instantly. Her husband was so completely overcome with grief that he was spared all questions as to details.

A Car Turns Over Three Times.—Near Boulder, Col., one woman was fatally hurt and two others badly injured when a car jumped from the road, turned over three times and landed at the bottom of a gully. While going down hill a car was observed coming in an opposite direction. Both machines turned aside to avoid collision. The one which was moving slowly ran up the bank of an irrigation ditch and stopped. The other was coming too fast to be controlled. It ran near the outer edge of the road which caved in, and the car rolled over and over. The injured women were hurried to the hospital and the body of the dead woman taken to her home.

All Due to High Speed.—A young society woman of Syracuse, N. Y., is in the hospital badly injured, and her escort is dead, owing to an accident while the car was being driven at a speed of from forty to fifty miles an hour. The driver turned out for a car coming from the opposite direction and his car crashed into a letter-box post and turned over several times finally landing right side up. The passengers were of course thrown out and the result was as stated.

Army Officer Gets Maxwell Medal.

Major F. R. Lang, U. S. A. recruiting officer at St. Louis, Mo., has been awarded a gold medal by the 50,000 Mile Maxwell Club for driving a Maxwell car 50,000 miles. Major Lang uses his car to make trips between the main office in the Old Custom House at St. Louis and five auxiliary recruiting stations in St. Louis, Hannibal and Alton.

Cost of Running.

From E. A. Caughell, Ontario.—Referring to the article on page 66 of the August number, "Who can afford a car," and article No. 950 by D. W. McFarland, re cost per mile of operating a car, and other articles in former numbers on this subject, I would like to say that I think in nearly every case the actual total expense per mile is away too low.

I have been driving a car for three years and the expense given in this article is less than it has cost me, owing to improvements put on the car, which while not necessary for the perfect running of the car, added to my upkeep, viz.: Self-starter, self-lighter, fore doors, new carburetor, changing oiling system and having all bearing parts nickle plated.

The following is, I believe, a close estimate of the actual cost to the average private owner who has a private garage. For a five-passenger car costing \$1,500, weighing 2,500 pounds, with 32x31.2 tires, and run 3,000 miles a season, it will be found to be a fair average I think. You will notice also that no amount has been set aside for washing and cleaning, it being presumed that the average owner does this and makes minor repairs.

Gasoline (Canadian prices for imperial gallon) for 3,000 miles, 200 gallons at 25c., \$50.

Oil, 15 gallons at \$1 per gallon, \$15.

Grease, estimated, \$7.50.

Repairs, estimated (not too low for a period of 5 years) \$25.

Lights, 4 tanks at \$2.50, \$10.

Waste and rags, \$5.

Varnishing and painting each fall, \$15.

Tires, four tires at \$25 each. Three thousand five hundred is the guaranteed mileage by makers and while some tires exceed this, the average, taking into consideration accidents and repairs, will, I am sure, not exceed 3,500 miles per tire, \$85.

Interest, 5 per cent. on investment of \$1,500, and the money if not in a car would bring this, \$75.

Depreciation for a period of five years, which perhaps again is a fair average of the length of time a private owner runs a car before changing for a new one. He would probably receive—if he was a good caretaker and handler—for his car at the expiration of 5 years half the original price, in this case \$750. Therefore, the depreciation per year is \$150.

Insurance, four kinds should be carried: fire, damage, personal liability and collision. The fire would be carried the full year—say \$1,000, at 21.2 per cent. equals \$25. The other three should be taken by the year but could be canceled from November 1st until May 1st and 40 per cent. of the rate would be returnable. The tariff on these three for the full year is about \$60, depending on horsepower of the engine. The refund of 40 per cent. would make the total with fire insurance \$57.

Of course it is optional with the owner whether he carries the insurance or not but if he prefers to carry the risk himself the expense should be charged up just the same. The insurance companies say it is worth \$57 to carry it. So the total expense is \$494.50 per year (for a private owner to run his car for 5 years, a distance of 3,000 miles each year) or over 16 cents a mile. However, to run 5,000 miles per year would reduce cost per mile but would increase the cost per year of every item given except interest and insurance, although the depreciation would not increase in proportion. Five thousand miles per year would cost \$612 or about 12 cents per mile.

I think the above is a correct statement of the actual cost if figured on a strictly business basis. If not show me.

Note.—From Mr. Caughell's point of view, the foregoing figures are not far out of the way, but reckoned from another and possibly a fairer viewpoint, they could be reduced considerably. At the outset, gasoline can be purchased in this locality for about fifteen cents per gallon. Reckoned at twenty-five cents for the Imperial gallon, which is larger than our gallon of the United States, the cost in Canada of gasoline is about twenty-one cents a gallon. A good car, well-cared for and driven, should give rather more than fifteen miles to the gallon of gasoline. The figures for oil and grease are likewise too heavy as to quantity and price, oil costing about 60 cents a gallon. Nor does the car need painting and varnishing every year if properly cared for. As to the matter of tire expense, by the use of protectors, after the tires are somewhat worn, the bill might be very considerably reduced. Interest on the investment is a consideration which is not usually included in the cost of operating a car, any more than the interest on a man's house is considered a part of his family expenses. As to the insurance, if the car owner exercises care, absolutely nothing need be charged up to this account.

It is not our purpose to question the logic of Mr. Caughell's figures or conclusions, but merely to make the point that estimating the cost of running a car is a good deal like estimating the price of a yard of cloth, which varies all the way from four cents to two dollars. However, the matter is interesting and timely in view of the fact that a good many do not properly figure how much their cars are costing them.

In passing it may be stated that just at present we recall that two Boston men say they have driven their cars, weighing a trifle over 3,000 pounds each, one 8,100 miles on one set of tires without removing them from their rims, and the other 13,000 miles. Of course this is unusual, but such use would materially reduce the tire cost as stated by Mr. Caughell, if he could get any such mileage.

Finding Radiator Leaks.

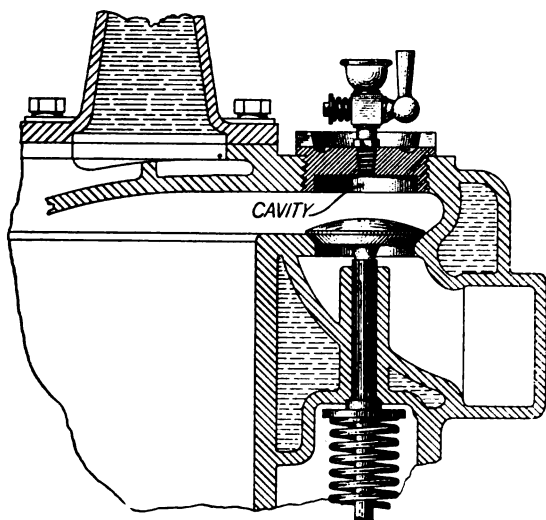
Unless an expert none should attempt to solder a radiator, for he may open up a few of the surrounding cells and cause more harm than good. Radiator leaks are hard to find usually. They may be often detected by steam issuing from them, but if this is not the case, and the exact spot from which the water is escaping cannot be readily determined, the best thing to do is to remove the radiator. Plug up all the openings, such as inlet and outlet, except one, with corks or wooden plugs. Then into the opening which still remains open, place a plug through which the tube of a tire pump passes. Place the radiator in a tub of water and pump air into it by means of the tire pump. Bubbles will issue from the leak or leaks, which should be immediately marked with chalk so as to be easily located later when the radiator is removed from the tub.

Dry batteries may be revived temporarily by perforating the bottom and soaking them in water for about fifteen minutes. This will renew them for a short time only, and should not be attempted unless on the road where no other alternative is at hand.

A shovel and one hundred feet of good hemp rope will get you out of many a difficulty.

Decreasing Compression.

A soft performing motor is one where the power does not increase in direct proportion to speed, and when the automobile is being accelerated it gets under way lazily, due to the fact that the motor is relatively lacking in vigor. A hard performing motor, on the other hand, is snappy, the automobile is accelerated smartly, but this type of motor stalls readily. The soft performing motor has a low initial compression, but it holds this compression over a considerable range of speed, after which the compression dies down at a relatively slow rate. The hard performing motor has a high compression, and the rate of falling off of the compression is lower than the rate of increase of speed, if the power increases as the speed, up to a certain point, after which the compression crashes down, and the motor stalls. The illustration shows the section of a cylinder of a motor for a high



Section of a motor cylinder showing a noise cavity formed in the valve cover.

compression, and when the motor was put into service it was found that the compression was a little too high, thus making the motor a cranky performer in ordinary service. To correct this evil from the ordinary service point of view, the valve caps were designed, leaving a cavity in them whereby the compression space was increased.

To Prevent Flying Water.

In a recent issue attention was called to a steel mesh shield to prevent mud from flying outward from automobile wheels in wet weather. It appears that the idea is not new. A reader informs us that the big auto 'busses of Paris have been using a mud shield of this description for nearly a year. There should be no objection to the use of something of this sort when the streets are covered with water. Automobiles have their rights and so do pedestrians. Neither have any rights to the exclusion of the other. The shield should be easily attached or detached, for of course it has not the slightest use except in conditions as stated.

A Brass Polish.

One part ammonia, two parts alcohol and enough finely powdered calcium carbonate to form a creamy liquid. This is wiped over the part and allowed to dry. It is then wiped off and the part will appear clean. The alcohol and ammonia dissolve all the dirt and oxides while the chalk or calcium carbonate absorbs them, so that when the parts are dried off the impurities will be removed.

GOOD DRIVING.

Essential Mental and Physical Qualifications and How to Become Expert.

Some one has said that the character of the driver can be diagnosed to some extent by his method of using the horn. This is perfectly true, for almost every action betrays certain traits in a man's character. The nervous, irritable man toots practically all the time, the pompous gentleman drives right up to blocked traffic and sounds a long note, assisting the efficiency of the horn by the ejection of vocal sounds; the phlegmatic individual treasures the horn so much that he sounds it not at all lest it might wear out, and so on.

Once in a while it is instructive for the driver to sit in the back seat of a car and be driven. He will see things from an aspect he never thought of previously, and pondering these may possibly discover unlooked for defects in his own driving. For example, he will have demonstrated to him the treatment he metes out to others, both in and outside of the car.

To become an expert at car driving the graduate must possess certain well defined physical and mental qualifications. His senses of sight, hearing, touch, and smell ought to be perfect, and he must have an innate sense of fairness. This latter is possibly the most important sense of all, for without it good driving is an absolute impossibility. The man who is a boor in the everyday walks of life is still a boor when driving a car; even though he may have acquired a veneer of decency, this really does not count much, for the deposit is usually so thin as to be useless—it rubs off at the slightest provocation and reveals what is below in all its glaring hideousness.

Having passed the elementary stages of steering, changing gear, etc., the driver who owns his car naturally wishes his friends to partake of the pleasure he derives from his car. Presuming that one of those friends is of the nervous type and prone to speak his mind, he will possibly do so, and tell the driver-owner just what he thinks. There will be, as a rule, much rubbish spoken, but after careful sifting there may be a small residue of value which should suggest how the driving appeals to at least one passenger.

The point is that it is not sufficient to take a car load of friends there and back safely, but that the run should be, as far as the driver is concerned, easy and pleasant. Take gear changing, for example. How many amateurs change gears really well? Very few. The fine point in gear changing is to do it so that the passengers know nothing about it. On coming to a hill the good driver will know to the fraction of a second when to drop from fourth to third. His ear will tell him the note of the engine when the revolutions will remain constant, or he will know from his speedometer, if not instinctively, the limit of his high gear without laboring of the engine.

The finer points in regard to meshing the gear ought to have been mastered before the owner pretends to take friends out. The gear system in cars varies much. Thus, to go from neutral to first the clutch may have to be put right out; from second to third, half out; from third to fourth a mere touch of the clutch pedal and a quick movement of the gear lever moves it into high nicely. No hard and fast rule can be laid down for a sort of universal method of good gear changing. Cars differ so much that the careful driver will worry out for himself the method which suits his particular car best. Bad gear chang-

ing may be due to carelessness, fondness for the high idea, fostered, unfortunately, by many manufacturers, or by sheer nervousness in very many cases. The driver wants to do the job well, and in his eagerness overdoes it.

In taking out a car for a run, the good driver will first start the engine and allow it to run quietly for a short time till it gets warm. The driver mounts, lets in No. 1 gear, and without accelerating slips in the clutch quietly. The car then moves off without a tremor. After a revolution or two of the wheels No. 2 gear is meshed, and after meshing a little more throttle is used. A similar process follows with gears Nos. 3 and 4. The passenger is almost unconscious of anything going on except that the car increases in speed quietly and without fuss. Proceeding a little further, the driver, on the level, tests both hand and side brakes. The controls are then set, ignition as far advanced as possible, as much extra air is given as the engine will take without weakening. If an animal or other obstruction appear, say thirty or forty yards away, without touching the clutch pedal, but throttling down, the driver gently applies the foot brake. This, of course, neither chatters nor is fierce; it brakes softly. The speed of the car is diminished, and thus, without having forged right up to the obstruction, flung out the clutch, and jammed on the brakes at the expense of tires and mechanism, the car reaches the obstruction easily. The text books tell us, of course, that we must not use a brake without taking out the clutch—quite good, but the closing of the throttle with the clutch in has done nothing further than to add a slight retarding effect which relieves the brake to a certain extent.

Coming to a hill, we ascend for a fair distance on top gear, and before the slightest suspicion of flagging of the engine occurs we drop to No. 3 gear. The engine takes up well, and the hill is surmounted. From the crest we notice a rather steep descent, so for safety No. 2 gear is used, and without touching the brakes we get to the level again. The run is uneventful for a time, and a well known stopping place is reached. A friend's car is at the door of the hostelry. Our good driver, on reaching the friend's car, notices a peculiar odor coming from the region of the bonnet, makes enquiries, and suggests that the inspection plate of the crank case should be opened on account of a peculiar acrid smell which emanates therefrom. Examination shows that the crank chamber is full of fluid, certainly not oil. Thus, had it not been for the powers of observation and well developed olfactory sense of our good driver, an unaccountable incident might have occurred to that engine.

The run home is without incident, excepting, perhaps, for a stray dog and an unprotected infant on the highway. Both are quite safe, however, for our driver has learned to anticipate trouble of this kind, and takes no chances—by the same rule that the man who carries most spares usually has no need of them.

The remark is sometimes made by a passenger, "How smoothly So-on-so's car runs." This is simply a left handed compliment to the driver, for, needless to say, no matter how good the machinery may be, a bad driver will convey the impression that all is not just as it should be.

The run is enjoyable alike for driver and passengers. No thrills, no excuses to make. The driver gives the impression that his job is easy and that in his hands a motor car is by far the safest vehicle on the road. Such a driver not only considers his own

feelings, but those of everyone else, whether in the car or on the road. Corners are taken quietly, gullies or holes at diminished speed, for the driver remembers that he occupies the most comfortable seat on the car. The possibility of traffic emerging from side roads is ever present. In short, the driving is perfect. In addition to a driver's duty to his car, passengers and traffic, other than mechanically propelled, there is the question of his behavior to fellow motorists. If this were always as it should be we would not have the space occupied in this magazine by accounts of flagrant acts of carelessness perpetrated by one motorist towards another.

The man who is unwilling to learn, and possibly owning a high powered car, has no right to presume that he has the right of way over the 6 h.p. two-seater, and similarly the owner of the low-powered car must not complain if the larger car passes him legitimately and in a proper sporting fashion on the open road.

The novice from the start should try to cultivate driving without undue fussiness, take corners quietly, and always assume that some careless individual may be coming round on his wrong side in the opposite direction. Study the knack of pulling right up to the curb without touching the wheels to it. This saves inconvenience in dismounting from the car. And again, if possible, while pulling up at a stopping-place, leave room for the car behind, so that its driver will not require to reverse before getting away.

It is well to remember also that there is no loss of prestige in giving way to slower traffic or pedestrians, should necessity arise; others have to be taught that the ordinary motorist is not the reckless, careless, own-the-road individual some people imagine him to be.

The Odor of Rubber Articles.

Rubber mats in the interior of closed automobiles are frequently objectionable by their odor. This can be removed, however, by subjecting them to the same process which is employed in the case of small articles of vulcanized rubber, such as tobacco pouches and dress-shields, which are carried on the person. The articles to be deodorized are placed in a metal box between layers of finely pulverized carbonized bone, and the box is then left for four to eight hours, according to the size of the articles, in a place, such as a drying room, where a temperature of 60 to 70 degrees Centigrade can be maintained. If the bonemeal is to be used again for the same purpose, it must first be brought to red heat in a closed metallic vessel, in the cover of which must be a vent, and it must be left to cool therein. The deodorized rubber articles must not be placed together with other rubber articles which have not been so treated, as they will acquire their old odor again, in that case, with surprising rapidity. Unburned magnesia powder can also be used for removing the odor. Merely sprinkling it over the article will have some effect.

Brakes and Tires.

Brakes not properly adjusted are the cause of many casings wearing out prematurely.

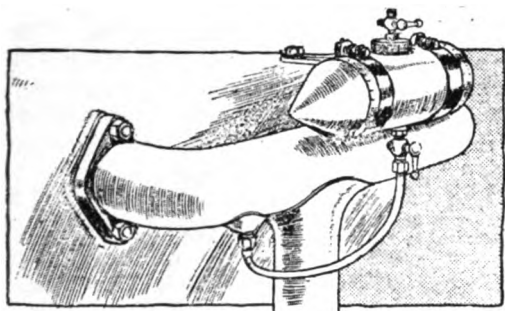
One drum is sometimes tighter than the other, placing most of the strain on one tire.

This has the same effect on the casing as skidding. It soon grinds the rubber off the tread.

Have your brakes adjuster if your tire shows the tread ground down in spots.

For Easier Starting.

In the Autocar, published in England, a reader states that he has fitted to the engine of his car a device of his own invention, which has made the car from being very difficult to start one that starts very easily and at the first or second lifting of the starting handle. It appears that he has protected this idea in England by applying for a patent. As the matter is of considerable interest, however, we reproduce a sketch showing how it is made. The small gasoline tank is fitted in the induction pipe or near at hand, and may contain a pint or even less of gasoline. It has an air inlet tap at the top and a gasoline exit tap where it is joined to a copper pipe of small bore leading to a small cup secured in any convenient way to the underside of the induction pipe. A small hole is made in this induction pipe to correspond with the size of the cup. When it is desired to start the engine, which is assumed to be normally supplied with a mixture which really requires enriching as to the amount of gasoline, the tap at the top of the tank is momentarily opened and closed; if then the lower tap be opened a small quantity of gasoline will pass into



A Help to Starting.

the cup on the induction pipe, but only a small quantity by reason of the lack of air entering the tank to take the place of the gasoline withdrawn.

The cup full of spirit then acts as a surface carburetor until, the engine having been started meanwhile, the gasoline is used up and the supply continues to emanate from the usual source—the jet of the carburetor proper.

Of course, while the engine is running it is advisable to turn off the lower tap to prevent waste which might occur if there should be a leak of air into the tank by way of the upper tap.

Although in the sketch only one cup is shown in a branched induction pipe, so that the richer mixture would only be drawn into the left-hand pair of cylinders, there is no reason why two cups should not be used, one on each side of the branched induction pipe, the gasoline pipe being also branched.

Will Remove Varnish.

The average person, when wanting to remove varnish or paint some article, removes the old coating with sand paper. This is a waste of time and labor, as old paint and varnish can be washed off much easier in the following manner:

Dissolve one-half cupful of washing soda in a pint of warm water, wet the article with the solution then scrub it with a stiff brush, rinse with clear water and let dry thoroughly before recoating. This method will easily remove varnish or paint from crevices.

With wheels out of true, you are wasting power as well as tires and your steering is impaired to a marked degree.

THE MUFFLER.**Requirements for a Good One and How It Best Operates.**

If ever there were a "mystery-box" on a car, says the Autocar, it is the muffler. Essentially a passive instrument with no, or few, working parts, it rarely requires attention, and probably even more rarely receives it. The average owner, even if he be otherwise thoroughly familiar with the mechanism of his car, very seldom knows what type of muffler is used. His chauffeur will probably only know if continued excess of lubrication has entailed its cleaning out. Provided, of course, the exhaust box gives no trouble and performs its functions with regularity and efficiency, there is no need for anyone to pry into its internal economy. At best it has no interesting motions, no complicated mechanism, its workmanship is commonplace, and its mien, both exterior and interior, unattractive. What more natural then that it should be regarded merely as a necessary attachment which is utterly devoid of interest?

Let us first consider the primary significance of a muffler, its requirements, and its mode of operation. When an engine exhausts into the atmosphere direct it gives rise to a noise by reason of the fact that the rapid discharges of gas at high velocity set up sound waves in the air which are duly recorded by our eardrums. The noise is essentially due to variations in local pressure in the atmosphere immediately surrounding the exhaust pipes. At the instant of discharge this pressure is relatively high, whereas immediately afterwards it falls again to normal, being similarly raised and lowered at a very high rate. In other words, it is the impact of the rapidly-moving particles of gas upon these stationary particles of the surrounding air that produces, through a series of atmospheric waves, similar impacts upon our hearing organs, in exactly the same way as the impact of a hammer upon an anvil gives rise to noise. The primary function of a muffler is to get rid of this noise by preventing these sudden impacts from taking place except upon air, or gas, which is in some way insulated from the outer atmosphere. If, for instance, the engine were caused to discharge into a thick-walled chamber which was closed to the atmosphere no noise would be set up, but obviously unless some means of relieving the pressure which would develop inside the chamber were used the engine would very soon stop. If the pressure were relieved by a pump which withdrew as much gas from the chamber as the engine put in, such a device would act as an excellent, though, needless to say, unpractical, muffler.

Cause of the Noise.

It has been sometimes suggested, as an explanation of the fact that air-cooled motor cycle engines are nearly always relatively noisier than water-cooled motors of a similar size and power, that the actual noise of the explosion inside the cylinder is heard more readily through a thin cylinder wall than through the double wall of cylinder and jacket. Such an idea is utterly wrong. The action which takes place inside the combustion chamber is purely a chemical one and cannot directly give rise to noise; it does not, in fact, do so indirectly until the exhaust valve opens and the pressure in the cylinder can react on the atmosphere.

The same end as the thick walled room can be compassed in a much easier and more practical way, all that is required for this purpose being a pipe of con-

siderable length and having thick walls. Now if this pipe be sufficiently long the air or gas it contains will have sufficient inertia and elasticity to absorb the discharge impacts and convert them into continuous motion. When the exhaust valve of the engine opens the outcoming gas will very rapidly accelerate that part of the column of air in the tube which is nearest the engine; this acceleration will be communicated to the whole of the contents, but owing to the elasticity and inertia of the fluid, the pulsating acceleration (as it were) at the engine end of the pipe will become a steady velocity at the other. If the pipe be long enough it will thus have at one end a series of violent gushes of pressure and the other a perfectly steady flow. The case is analogous to that of a row of men, arranged in a narrow corridor in single file. The front man can be made to progress at a steady uniform speed by virtue of a series of pushes maintained on the person of the rear man!

The Plain Pipe.

It is true that a plain pipe will act as a muffler but the length required would be altogether out of the question in many cases. If it be not very, very long, then the whole contents will tend to be accelerated all together and thus simply transmit the impact almost unaffected. In like manner, the file of men above referred to would need to be very long in order to damp out the oscillations produced by the pushes. But if the front man of a comparatively short file had to push a hand cart before him, this additional resistance would greatly enhance the damping effect, and he would progress with a steadier motion. The long plain pipe can be made an effective muffler if this analogy be pursued. If the orifice at its farthest end be constricted, a slight resistance is placed on the gas and a steady outflow is the result. Even so, however, the pipe would have to be prohibitively long.

Since the question is obviously one of reducing speed, in order to obtain a practicable length of pipe it becomes at once clear that the cooling of the exhaust gases is a matter of great consequence, since by cooling them their volume can be greatly reduced. Thus, whereas thousands of cubic feet of gas are entering the engine end of the pipe in unit time, during the same period only hundreds of cubic feet need be dealt with at the other, and at correspondingly reduced velocity. In other words, if the plain pipe have sufficient radiating area the egress orifice can be made quite small.

An Effective Muffler.

The first requirement of an effective muffler is, therefore, that its surface be sufficient to cool the gas down as nearly as possible to atmospheric temperature. Its pressure being similarly reduced, it can issue without any impact at all, accordingly, noiselessly.

We have remarked that the long exhaust pipe must be of thick material. This is likewise a matter of importance, because if thin it will simply vibrate under the periodic exhaust impulses, and so set up a sound, or rather a noise of its own. Many of the racing cars give out a very metallic-sounding exhaust. This is always due to the use of thin exhaust pipes and boxes. At the same time it is quite obvious that the thinner the pipe the better will be its radiating effect, hence a happy medium must be struck.

Another requisite is that near to the engine, that is to say where the velocity is very high, the exhaust pipe must be as free as possible from sharp bends,

and internal irregularities capable of causing surfaces of discontinuous flow, and constrictions. In order to see how necessary it is to observe this precaution, it is enough to consider the speed of the exhaust gases at the moment of their egress. Assuming that the piston speed is 1,000 feet per minute, and that the gases in the cylinder are at normal temperatures and pressure, then if the diameter of the exhaust pipe be half that of the cylinder (and its area consequently one-quarter), the initial speed of the gases through this pipe will be 4,000 feet per minute. But instead of being at atmospheric temperature and pressure, they are very hot (volume is accordingly greatly increased), and also under considerable pressure. Their speed will be, therefore, probably about 8,000 feet per minute, or, roughly, ninety miles per hour. At this high speed sharp bends exercise a great deal of resistance to flow, and even slight irregularities in the pipe section will set up surfaces of discontinuity—eddies, in other words. Any resistance thus set up must immediately react upon the power of the engine, for it not only opposes a braking effect to the exhaust stroke but allows an unnecessary amount of gas to remain in the cylinder and thus impoverishes and diminishes the volume of gas drawn in on the inlet stroke. When the velocity of the exhaust gas has been considerably reduced it will offer little resistance to going over sharp corners and through small holes which would well might arrest it altogether at a very high speed.

Back Pressure.

That this effect of high gas velocities is not generally realized is evidenced by the fact that people will often attempt to gauge the degree of "back pressure," or resistance of a small muffler, by blowing into it. At the low speed at which one's lungs are capable of expelling air a piece of fine gauze would offer scarcely any resistance, yet to gas at a high velocity it would act like an impenetrable barrier. Where perforated baffle plates or holes are used the size of them is immediately dependent upon their number and the extent to which the gas velocity has been reduced by the time it reaches them. Placed at the end of a long pipe a muffler might give little or no back pressure at all, whereas clamped direct to the engine it would offer a great deal of resistance indeed.

For this reason the design of the exhaust ports which are cast into the cylinders themselves is a matter of the highest importance, as no excellence in the muffler device can make up for the resistance which sharp corners, ill-conceived curves, or rough edges will set up at this point. It is, of course, a great advantage to have as much as possible of the exhaust outlet water-cooled so as to accelerate the temperature reduction at the moment the gas commences to leave the cylinder. In motor boats silencing is much simplified by the fact that the whole of the exhaust pipe and box can readily be water cooled.

So far we have considered only the case of a long pipe. Since this cannot be used on a car some modification has to take its place and accordingly practically every form of automobile muffler in use at the present time is simply a contrivance in which the gas is made to travel a circuitous course, so as to obtain the same effect as it would in a long pipe. Artificial resistances, such as baffle plates and perforated tubes, are used primarily to put a slight brake on the gas, and, secondarily, to break up the sound waves. It is in this regard that the constricted end of the pipe referred to previously is additionally valuable, as it has

exactly this effect. It acts, of course, exactly conversely to a megaphone, which develops the waves of sound, whereas the constriction reduces them.

Loss of Power.

It has often been said that the reason an engine fitted with a muffler (provided the latter be properly designed) will give more power than one exhausting direct into the atmosphere is that the exhaust from one cylinder acts like a pump upon that of another, and consequently sucks it out, and that a similar effect obtains with the successive explosions which emanate from one individual cylinder. This idea, though more or less founded on fact, is fallacious in the form in which it is generally expressed. What happens is this. When the engine exhausts direct into the atmosphere the discharged gas has to accelerate a mass of air from rest up to its own speed, whereas if it exhausts into a pipe which contains a moving column of air, the power required for such acceleration is less, and as a consequence the resistance to the egress of the exhaust is less. To argue that any "pumping" effect exists suggests that the speed of the gases inside the exhaust pipe is greater than that with which they are issuing from their exhaust port, which is, of course, absurd.

The minimum loss of power in this respect will obviously occur when the final exit speed of the exhaust gas is the highest, and that being so it is clear that for a given degree of silence of two engines, one six-cylinder and the other four, the former will gain the most from its muffler, since the exhaust delivers more impacts in unit time, and the speed at which the gas becomes free from impacts and moves with uniform velocity is higher. Similarly an eight-cylinder will be better than a six, and a two-cylinder better than a single. Not only so, but it is clear from what has been said above that the greater the number of cylinders in the engine the simpler can the muffler be made. To get the same effect a 12 h.p. single-cylinder requires a muffler much larger than a 12 h.p. four-cylinder—about four times as large, in fact. An engine with an infinite number of cylinders would exhaust silently if all its cylinders could be made to discharge into a short plain pipe. The gas would issue from it at the same velocity as it came from the cylinders, but since the velocity of the flow would be constant there would be no noise.

AUTOMOBILE LIGHTING.

Dynamo Requirements and Other Electrical Information of Interest to Car Owners and Others.

From Leonard Kebler before the Metropolitan Society of Automobile Engineers.—In determining the necessary qualifications for a dynamo lighting system for any particular use, the following points immediately become of importance:

1. The lamps to be used.
2. The dynamo output needed.
3. The dynamo speed and the method of driving the dynamo.
4. The proper size storage battery to be used with the dynamo selected.
5. The type of wiring.

The most important of these is "What lamps to use." After determining the lamps to be used we immediately know the amperes taken by these lamps, and from this the other points can be readily deduced.

There are only three size bulbs now in general use

for headlight work, these being respectfully 16-, 21- and 25-candlepower. For small motor cars which travel at comparatively slow speed, and where the owners would be satisfied with light that while better than acetylene lights, usually supplied with these small cars, is still not the most powerful, and where he will not be liable to the detriment of the 16-candlepower lamps, 16-candlepower is undoubtedly ample. In the higher powered cars the 21-candlepower bulbs are in almost universal use today. These will give ample light for driving up to a speed of, say, 40 miles an hour at night, illuminating the road far enough ahead so that any object may be observed in time to stop almost as well as in the daylight, and in fact gives all the light that is needed.

Such lamps when used with a shallow parabolic reflector will light a road 50 feet wide for the full width of the road from the front of the car to a point over a quarter mile away. A deep parabola of the same focus will light the road even farther, but will not give as much light at the sides close to the car.

Where extremely high-powered cars are used running at very high speed, and where very large reflectors can be used, 25-candlepower bulbs are sometimes used.

It must be realized that with small reflectors built to take a 16-candlepower bulb, the insertion of a 21-candlepower bulb will not give the proportionate larger amount of light on the road that 21 is to 16, and similarly a 25-candlepower bulb in a reflector built for 21-candlepower will not give sufficient additional light to warrant its use.

The reflector should be adapted for the particular size bulb to be used, and for this reason there is little use in using large candlepower bulbs in small reflectors.

With a commercial reflector having the greatest diameter of 8 inches, a 16-candlepower bulb is about all that can be economically focused. With one of 10 1/2 inch diameter a 21-candlepower bulb should be used, and there is little use in using a bulb larger than 21-candlepower unless you have a 12-inch reflector, which is very seldom seen on account of the large size.

We can therefore safely assume that the bulbs to be chosen for the headlights will be of 21-candlepower, these being almost universal for cars of over 25 horsepower today.

The side lamps and rear lamps are signal lamps only, and for these bulbs of small candlepower can be used. Four candlepower or 2-candlepower bulbs are adequate, and it is customary to use 4-candlepower side lights, and 2-candlepower rear lights. The amount of current taken by these side and rear lights is so small that there is no objection to using 4-candlepower bulbs for all three, or 2-candlepower for all three, but the desirability to have a brilliant light at the side, for appearance, has led to the use of 4-candlepower bulbs. Frosting these bulbs in the side lights gives a very pleasing appearance, and I think will be very largely adopted in the near future.

In addition to the heads, sides and rear, the car will probably be equipped with such current-consuming devices as a speedometer light and electric horn, very possibly a cigar lighter, in the tonneau or limousine, and similar lights. None of these lights, however, is used for a very long period of time, and in designing the balance of the system after having decided on the five main lamps it may be safely assumed that the overload capacity of the outfit will take care of these additional loads which are run for a short time only.

We have therefore assumed that the lamp load on an ordinary car should be two 21-candlepower headlights, two 4-candlepower sidelights and a 2-candlepower rear light. The two headlights will take 7 amperes, the two

sidelights 1.7 amperes, the rear light .6 ampere, making a total lighting load of 9.3 amperes.

The second point we have to determine is the dynamo output needed.

We have already assumed the light load to be 9.3 amperes. In order to make sure that we have ample overload capacity to take care of the many short loads made by the horn, speedometer light, etc., the dynamo should be capable of delivering to the storage battery, slightly more amperes than is required by the lamp load. For this reason an ampere output of 10 amperes of the dynamo has been almost universally accepted as the proper amount when such a lighting equipment is used. This will keep the storage battery always up to the best efficiency, and at the same time it is small enough, so that the storage battery will not have to have too large plates in order to run without undue deterioration.

The dynamos should be so geared to the car as to give its full output at from 15 to 18 miles an hour, and any speed above this.

At a speed lower than 15 to 18 miles an hour, the car will not be driven for more than a very few miles with all the lights lighted, and the reserve capacity of the storage battery will more than make up for this short time. Of course when the car is being driven in the city where the headlights are not being used, it often runs slower than this speed, but at these lower speeds the dynamo is generating a proportionately smaller amount and will give ample current to take care of the two sides and the rear lamp which takes only a total of about 2.3 amperes.

A shunt-wound dynamo which will deliver 10 amperes at, say, 15 miles an hour, will deliver 2.3 amperes at 8 to 9 miles an hour, so that whenever the car is running it will supply ample current for the sides and rear lamps.

We have now decided that the lamps to be used continually will be two 21-candlepower heads, two 4-candlepower sidelights and a 2-candlepower rear lamp. Also for this we will need a dynamo of 10 amperes at from 15 to 18 miles an hour.

The next point is at what speed of the dynamo should we get 10 amperes output, or, in other words, what shall be the ratio of speed between the dynamo and the engine, and what shall be the method of driving the dynamo.

These two points are so inner-related that they should logically be considered together.

The size, weight, and consequent cost of the dynamo, is determined not only by the ampere capacity, but also the speed at which the dynamo will deliver this 10-ampere capacity into a 6-volt, 3-cell lead battery.

In this paper I will not enter into discussion as to the relative size, weight and cost of shunt series compound or magneto type dynamos, and simply limit my statements to the fact that in dynamos of any one type, the size, weight and cost is determined by the ampere capacity and the speed at which this number of amperes can be put into a 3-cell lead battery.

The cost of a dynamo which will deliver say 6 volts and 10 amperes at 1,500 revolutions per minute, is 30 per cent. less than one which gives the same output of 1,000 revolutions per minute, and it is less than half the cost, and of about half the weight of one designed for the same output at 500 revolutions per minute.

A shunt-wound dynamo designed to put 10 amperes into a 3-cell battery at about 1,000 revolutions weighs approximately 21 pounds, and can be made approximately 8 inches long by 5½ inches high by 4¾ inches wide. If we reduce this speed to 500 revolutions the weight becomes approximately 33 pounds, and the dimensions approximately 9¾ inches by 7½ inches by 4¾ inches.

This 1,000-revolution dynamo should be run at about twice engine speed for the best results, and the 500-revolution dynamo should be run at engine speed for the best results. The question immediately comes up as a matter of judgment, whether there is sufficient advantage in running at the slower speed, to make up for the added weight and the added cost.

It will be found in general that where a shaft is provided on the engine to which the dynamo can be coupled, and this shaft runs at engine speed, the added weight and cost of the engine speed dynamo is warranted because it eliminates the cost and complication of sprockets and chain for driving the dynamo. But where such a shaft would have to be put specially in the engine and driven by gears, or when some shaft already projecting runs at engine speed, but is not so located that the dynamo could be directly coupled to it, and consequently either gears or sprockets and chain have to be used, there is little question but that a dynamo delivering its full output at 1,000 revolutions per minute and running at about twice engine speed is the happy mean in the weight, cost and size. A dynamo which will put 10 amperes into a 3-cell battery at 1,000 revolutions, driven at twice engine speed on a car with 36-inch wheels, geared 3½ to 1 on the back axle, will start to charge the battery at from 6 to 7 miles an hour and will give enough current to supply all the lamps—about 10 amperes at 15 miles per hour.

The same dynamo on a car geared 3 to 1 with 36-inch wheels starts to charge the battery at 9 miles per hour, and will deliver enough current to take care of all the lamps at 18 miles per hour. Such a dynamo I believe to be the ideal one where there is no provision made for driving directly at engine speed.

A machine running at higher speed than this has not sufficient advantage in less weight and cost to warrant the higher speed of the chain and the higher speed in revolutions per minute of the armature and to warrant the additional wear on the bearings and additional chance for noise. At the same time the use of a dynamo at less than twice engine speed to get a reduction in chain speed and wear on the bearings has not sufficient advantage to warrant the use of a larger, heavier dynamo running at say engine speed and driven by chain or gears.

On a dynamo driven by ¾-inch pitch silent chain at twice engine speed, sprockets of 30 and 15 teeth would be used. At 45 miles per hour this chain would run at 1,500 lineal feet per minute and at 60 miles per hour at 2,000 feet per minute. This is not an excessive speed, but if a dynamo giving its output at 1,500 revolutions per minute were used, running at 3 times engine speed, we would use 45 and 15 tooth sprockets, and the chain speed becomes 2,250 feet per minute at 45 miles per hour and 3,000 at 60 miles per hour, which is too high for efficiency or long life. We may therefore decide not to run our dynamo at over two times engine speed.

On the other hand, where it is possible to drive at engine speed through an Oldham coupling, the ideal case is undoubtedly reached, and in this case the additional weight and cost of the dynamo is warranted, as we save the additional cost of sprockets and chain and eliminate the necessity of oiling these, etc.

Having determined the lights to be used, the dynamo output and the relative speed of the dynamo to the car, the next point to determine is the method of driving the dynamo.

A very useful method of driving the dynamo is to extend the pump shaft through the pump, leaving an extension back of the pump to which the dynamo can be directly coupled by means of an Oldham coupling.

In other cases it is possible to have the armature shaft

of the dynamo extend through both ends and drive from the timing gears through the dynamo armature to the magneto, having the magneto and the dynamo lined up in tandem. In each of these cases a dynamo running at engine speed is used for the 4-cylinder car and $1\frac{1}{2}$ times engine speed for a 6-cylinder machine.

When neither of these methods is possible, and it becomes necessary to drive the dynamo by gears or silent chain, we will then use the higher speed machine, running at about twice engine speed, and this can be driven in a number of different ways.

Where the pump is driven separately from the magneto it may be driven at twice engine speed and the dynamo can be run directly from the pump shaft through an Oldham coupling.

Where a shaft running at twice engine speed can be installed projecting from the gear box, it can be driven by gears or chain running in oil, and then the dynamo can be directly coupled to the shaft. This gives a noiseless and almost wearless shaft.

A sprocket on the pump shaft or magneto shaft driving a sprocket on the dynamo by silent chain at twice engine speed is quiet, efficient and satisfactory. It is, of course, better if the chain can be enclosed and run in oil.

Any one of these methods has been proven to be entirely satisfactory in practice and have long life and to be quiet.

Having determined all the necessary features of the dynamo regarding its output, speed and method of drive, we turn to the storage battery. The first thing to determine is the proper size storage battery to use with the dynamo selected. A proper storage battery must fulfill two conditions. A. If the car owner runs entirely in the day time the battery must have sufficient square inches of plate surface to be charged whenever the engine is running at the maximum dynamo amperes without injury to the battery. B. If the car is standing still with all lights lighted, the battery capacity should be sufficient to keep all the lights burning for six hours, and when only the side and rear lights are on it should be capable of keeping these lights for, say, two nights, or 24 hours.

Considering "A," experiment shows that a battery having 160 square inches of positive plate surface and 200 square inches of negative plate surface will not be injured by use with a dynamo giving 10 amperes output on an engine. Such a battery would undoubtedly be ruined if 10 amperes were put into it continually on the test bench, but the conditions in motor car service are so different as to require some comment.

There are two things that cause rapid deterioration of storage batteries when they are charged continuously at high rate. The first is that the heating of the battery due to continuous charging softens the plates so they become readily disintegrated. The second is that large bubbles of gas form on the negative plates, and when these bubbles break away from the plates they take particles of the active material, especially when this has become softened, due to heating.

On motor car work, in the first place, it is very seldom that a battery is charged continuously at the maximum rate for more than two hours at a time. There are always stretches of a few minutes when the engine is slowed down, so that the dynamo does not deliver its full output, or when the engine is stopped entirely, and the battery has a chance to cool off. As a result, the service is not at all analogous to tests made on a test bench where the current is put into the battery continuously. On a test bench the battery would get hot, but on a car it will not.

In fact, in a battery with the plate surface already decided, there is little or no heating in the most severe service.

In the second place, the large air bubbles do not have a chance to form on motor car batteries due to the jarring and jolting that a motor car gets in going over the road. Before the bubbles have time to become large enough for them to take off a serious amount of active material when they break they are jolted loose and do not injure the plates to any material degree. As a result, it will be found that storage batteries can be run at almost double the charging rate without undue deterioration on a motor car that they can run when standing still on a bench.

The mechanical agitator now often used for large stationary batteries to keep bubbles from forming is replaced by the jolting of a motor car, and the various methods of cooling often adopted for large stationary plants is taken care of in this case by the occasional slowing down of the engine and occasional stopping of the engine.

A battery on a motor car is run under ideal conditions, because it is being constantly charged and discharged under ideal conditions as regards agitation and coolness.

A battery having the plate surface mentioned above will light all the lamps; that is, discharge at $9\frac{1}{2}$ to 10 ampere rate for about $3\frac{1}{4}$ hours, and will light the side and rear lamps for 24 hours. Such a battery does not light all the lamps long enough, so that if batteries of this size are used there should be two of them, or a larger capacity battery having at least 80 ampere-hour capacity at a 10-hour rate can be used. Any battery made by a reputable maker and having 80 ampere-hour capacity at a 10-hour discharge rate will fulfill all requirements.

This latter battery will fulfill all the specifications and has ample plate surface, ample capacity to run all lamps for at least 6 hours and the side and rear lamps for 24 hours.

Having determined the size and best method of operating our lamps, dynamo and batteries for any particular installation, the next point that becomes of interest is the method of wiring.

The use of a bayonet lock socket has now become universal for practically all connection plugs and all lamp plugs, so that there is little need of discussing this. One point, however, that is not entirely cleared up in a great many people's minds is the type of wire which should be used for motor car work. In making a recommendation to a Special Advisory Committee of one of the Standardization Committees of the Society of Automobile Engineers, I recommended that the cable to be used for motor cars must stand a test of 12 hours' immersion in oil, 12 hours' immersion in gasoline and 12 hours' immersion in water, and then stand 500 volts applied between the two conductors without a breakdown. Such a wire I believe has ample insulating capacity and will take care of any oil, gasoline or water that it may get in motor car use.

Wherever there is any abrasion the cable should be armored either by a light woven metallic armor or by conduit, loom or some similar material.

There is no use armoring against heavy abrasion such as might be gotten by the wire rubbing against the fly-wheel, as any armor will wear through rapidly in this case, but the armor should take care of the abrasion that occurs on the leads of the lamps as they swing against the frame or some similar part, and almost any of the woven metallic armors will do for this.

Wherever rubber or material that would be dissolved by gasoline or oil is used for insulation, it should be pro-

tected by another covering impervious to oil or gasoline, so as to render it impossible for the insulation to be ruined.

I believe this covers most of the points that an engineer designing a car would want to cover in his specification for a lighting system, with the exception of the method of regulating the output of the dynamo. Each manufacturer of motor car lighting systems has a different method of doing this, and it is therefore impossible in a paper of this kind to discuss the matter without either praising or condemning the methods used by various manufacturers. For this reason I think it best to leave out entirely in this paper the method of regulating the output of the dynamo.

The Swine of the Road.

BY S. G. RICH.

Probably half the road-hogs are unaware that they are hogs, but this does not make them the least bit less annoying or dangerous to meet on the road. Moreover, they are found not merely in cars, but fully as often they drive horses.

I was riding through Y—— village, in New York State, this spring, on a motorcycle, and came to a place where the center of the street had been oiled a very few hours previously. Such places spell a bad skid for a car but mean a sure spill for the cyclist if his steering is not absolutely straight. On each side there was an unoiled strip just wide enough for one wagon or car. I rode along this strip for nearly a mile, and then found a slow-moving horse rig ahead of me. I blew my horn, but he kept on dawdling in the only part of the road that was safe for motor traffic. Finally I tried to pass him and at once found myself mopping up large gobs of the oil with my clothes. Monsieur le Hog didn't even stop to see if I was hurt, thanks to his refusal to turn out into a part of the road that was safe for him but not for me.

As a matter of fact it is the motorcyclist who gets the worst work of the Hog. It is thought by Mr. Hog that he is meeting just an every day bicycle. Really he is up against a machine that is as fast as most cars, and whose handling in mean going is harder than that of almost any car. Since many motorcycles are without a clutch, their starting if stalled by a Hog in sand or on a hill is a serious matter. Even with a clutch, it is not always easy. And going into the ditch is liable to be a serious affair for the rider or the machine or both. As I was going through the central part of the White Mountains this summer, I took a fall in some loose gravel that had been heaped on the road to repair it. I lost over an hour fixing a broken control and a badly bent pedal crank.

If you want the motorcyclist to call you a decent man, turn out for him just as far as you would for a car, especially in sand or rutty stretches. And if he is riding on the left hand side through a bad piece, where perhaps the right is impassable for him, don't make him cross over.

The man who won't turn out enough when passing is about the most irritating Hog. He is quite common among horse drivers, especially in the country. In parts of western Maine, it is a saying of local motorists that every New York car is driven by that sort of Hog. From the way the drivers of most of the cars with New York license tags that are met in that region act, this remark is well justified. The man at the wheel of a car with one of those red N-Y tags on it, usually a big roadster or touring car,

seems in most cases unwilling to give a smaller car its share of the road.

But the horse-driver is about as bad, in many regions. Quite often one meets a man who drives a skittish beast or one that will not obey the steering lines. This cannot be excused as "the horse's nature." It means careless training of the animal in every case. And one might think by this time that autos are common enough so that all horses could be used to them. A friend of mine met a skittish horse in the Crawford Notch on newly-graveled going. The driver refused to turn out half the road's barely sufficient width, and the horse cavorted over the whole surface. My friend could not stop in time to dodge the oncoming nag, so he tried to pass in the narrow strip the driver who wouldn't turn out at all had left him. His left rear wheel slid off the gravel heap into the ditch, and the more power he put on, the worse he became stuck. Herr von Hog had gone on, without stopping to see if he could help. Finally we had to hire a farmer's pair to drag us out. It is bad enough to drive a skittish horse, but it is inexcusable not to turn out or to have a horse that won't obey the lines.

The Hog that honks and honks to pass you and then stays just in front of you giving you his dust and oil smoke (for he is often a mechanical dub) is rather exasperating. He is akin to the Hog with a plodding horse who delights in delaying autos and making them creep along on low gear for a half mile or so, passing numerous good spots for turning out.

Then there is the fool Hog, usually a "collech" young fellow from the city or the chauffeur of a rich man's car obeying his ignorant boss's orders, who goes through narrow twisting country ways and dangerous spots however well indicated by "Automobiles Go Slow" or other signs, lickety-split. It is positively risky to meet this Hog. Almost every motorist can recall narrow escapes from collision or locking wheels with such Hogs, and can remember his fear as he turned out sharply, as to whether he would be ditched and upset.

Are you an unconscious road Hog?

Don't feel hurt at the insinuation. Just think it over and recollect how you swear at the Hog yourself. And often he doesn't know he is a Hog.

Get wise.

Read the Advertisements.

From O. H. Hampton, Indiana.—Read the advertisements. They are the daily record of the new things coming into the world. The man who has the habit of reading advertisements will say without hesitation that a large proportion of the new things that have come to his notice were first seen in the form of advertisements, and that he would probably never have known about them otherwise. Some of the things learned about in advertisements were just the things he wanted. He has often been able to buy cheaper because of advertisements, and to sell cheaper for the same reason.

Take the motor car owner as an illustration. He is never going to be done buying accessories and various helps and handy little devices that are labor savers, time savers, money savers, and wear savers, because there are constantly new things being invented along these lines and he learns about them through advertisements, and many of them would never be known at all if they were not advertised.

Not only is it "good business" to keep posted through reading advertisements, but it is interesting

to keep track of the progress of the world through them. The advertisements in this paper lack but little of being an encyclopedia of motor car things and record of motor car improvements. Some new inventions are to be found in every number.

If you are not in the habit of reading them just go through the "ads" in this number and see if you don't learn about something you never heard of before.

There are men so short sighted that they grumble because so much of the paper is taken up with advertising matter and they feel that every page of advertising has cheated them out of that much that was coming to them. They forget, or perhaps do not know, that it costs more than the subscription price of almost any paper to publish and mail it. The advertisers are the people who really pay the cost and what profits there may be in publishing a paper. As the advertisers are paying most of the bills and giving us valuable information in many cases, it looks like it was up to us to read what they have to say.

There is another class of readers, a small class in these days we hope, who set down all advertisements as fakes and snares to trap the ignorant. It is true that there are dishonest advertisements, but no respectable papers will knowingly accept any advertisements that do not advertise honest goods, advertised by square dealing firms.

The writer considers the Trouble Department and the advertising as the most valuable parts of The Automobile Dealer and Repairer, because he has learned more from them than from any other sources except in actual shop and road practice.

REPLACEMENTS.

Suggestions for Repair Men in Relation to the Matter of Size.

Quite likely most repair men are fully aware that in some cases, replacement parts do not always fit. The wear of the part itself may be provided for, but where other parts wear with the replacement part, a new part of the original will not fit. Take the case of piston rings, for illustration. Not only do the rings wear, but the grooves also, and to make a good job of a repair the grooves should always be trued up in the lathe, as the grooves, do not always wear parallel, the top groove wearing more than others. To fit in these grooves a new ring of the original size would be of little use, even if the grooves had not been trued, but only worn. Yet a good many makers stock piston rings in one width only. The gudgeon pin is another case in point. This wears in the center, but the small end of the connecting rod wears also. To fit another gudgeon pin here of the original size would be useless without fitting a new bush to the connecting rod. As many rods are not now bushed, the only thing to do to avoid fitting a new rod is to grind out the small end until the hole is truly circular, and fit another pin of larger size, and often this is obtainable from the makers. This repair also necessitates reaming or grinding out the holes in the piston. One of the best methods of meeting this case is that adopted by one maker. The gudgeon pin is coned at each end where it fits in the piston, one end being considerably larger than the other, the center part of the pin, on which the connecting rod works, alone being parallel. This part of the pin is not finished to standard size on the spare pins, but it is left 0.002 inch, 0.004 inch, 0.006 inch, 0.008 inch, 0.010

inch larger than standard. Should the rod have worn, the hole is ground out to fit one of these pins, the hole in the piston remaining unaltered.

The number of parts on which allowance would have to be made for wear is, however, very small, and as practically only one dimension would need to be altered from standard in each part, the cost of production should not be increased more than 10 per cent.

The following list gives approximately all the parts that should be stocked with an increase in size over standard. In most cases only one size need be made; after this is put in and the part again wears, the part in which it fits is also worn, and would be replaced by a new one of standard size. An exception to this is the connecting rod big end bearings and crank shaft bearings. These need only be left small in the bore, and can then be bored out to fit after the crank and pins have been trued up.

Engine.—Piston rings; gudgeon pins; connecting rod bushes; main bearing bushes; cam shaft bushes; push rod guides; push rod rollers and pins; clutch bushes; clutch rollers and pins.

Chassis.—Steering pivot pins; steering rod pins; steering column bushes; worm segment bushes; pins for torque rods; universal joint pins; pins for brake gear; shackle bolts.

All bearings, except those of the engine, are taken to be of the ball cage type.

There are certain parts of a car which it does not pay even a large repairing firm to touch, unless the firm is going to seek for outside work in the various departments that would have to be created to deal with these parts. They are as follows:

The electrical equipment of a car, including magnetos, coils, dynamos and accumulators.

Bevel and worm gearing. (See Plant.)

Artillery wood wheels.

Radiators and lamps.

Springs.

Tire covers.

With regard to the latter item, it only really pays to do minor repairs to inner tubes. Where a tube has to be cut and spliced it cannot be done as satisfactorily and at such a low price as by one of the large tire firms.

A Word of Caution.

It is well known that by far the greatest number of accidents have occurred by skidding or slumping on high embankments, the car overturning and pinning its occupants underneath. This is due usually to two causes, skidding on a wet narrow road, or a slumping bank under the wheels, in attempting to turn out. It must be kept in mind that each wheel of the average touring car carries a load of from 1,000 to 1,500 lbs., therefore, cannot with safety approach the edge of a high banked road either in wet or dry weather.

A broken front spring may be driven on temporarily by jacking the car up on this side and binding with rope or wire a heavy piece of wood to the top of the broken spring. Remove the jack, allowing the frame to settle down upon the wood, and drive on carefully.

It is well to carry an extra gallon or two of good cylinder oil in cans strapped on the running board, as the oil you obtain in small towns is not always the best, and often when out of oil you will find yourself beyond even a small town.

STEAM CAR DEPARTMENT

This department is intended for owners, users and others interested in the steam car.

Those who have trouble with their steam cars are asked to give clear and full particulars, and their queries will be answered as correctly as possible by an expert. It will be considered a favor if our readers will contribute to this department, giving such information as may be useful to others using the steam car.

White Steamer Information.

From E. J. Cahill, Wisconsin.—I am always interested in steam cars, as I think almost anyone is, after having a thorough demonstration of their operation, as compared to gasoline cars. Their ease of control, noiseless action and wonderful power, running either slow or fast, appeals to one who loves or is sympathetic to fine running machinery. I do not own a car, but was employed by the White Company until two years ago. In regard to Dr. B. S. Hall's trouble, I would say that, first, be sure that he has a good packing which can be purchased at the White Company, or any of their agencies. In setting the valves, first get the dead center. Now, put engine on high dead center and measure the admission side of the valve which is best done by a thickness gauge. Now, turn the engine on low dead center and take the same measurements on the opposite side of the valve and divide the difference. The clearance of cylinder head for high pressure should be seven-sixteenths of an inch on high dead center and three-eighths for low pressure. Other causes for leaking stuffing boxes would be, steam too hot; lack of lubrication in the cylinders which I am inclined to believe is the trouble, as he states that the oil for the engine or crank case is fed twice as fast as oil to the cylinders, which would seem that the cylinders were not getting enough lubrication; or valve stems and piston rods may be rough, packing caught under edge of gland, leaking throttle, etc.

Dr. Hall states he has steam set at 550 pounds but the temperature is not at 390 degrees hardly any of the time. Now, a great many things might be the cause of this but I would think from what he says that it is wet steam, which could be caused from the thermostat being adjusted too low. One full turn of nut on the thermostat by-pass valve stem increases or decreases the temperature 90 degrees centigrade, so by turning the nut one hectogram or one-sixth would change the temperature 15 degrees; or the thermostat might have a weak or short spring; stuffing box too tight; seat out of line; seat leaking, or wet steam could be caused by water leaking past the flow motor piston or piston binding, or wrong fuel ratio; choked supply; dirty strainer, tank and hand valves not open wide enough; vaporizer dirty; nozzle tip clogged. Now I am speaking of the steam line thermostat which began the latter part of 1907, and, as Dr. Hall states that his car is a 1907, I take it for granted that it is equipped with a steam line thermostat. Another reason why I am inclined to believe that it is wet steam, is on account of the engine knocking or vibrating on first starting or climbing a grade, which is frequently caused by wet steam. Of course, it would make a difference whether the engine was running simple or compound. If compound, the vibration could be caused from leaky simpling valves, or sand flaw in cylinders, piston slide valves cut, or broken piston rings. But if running simple or

compound, loose fly wheel, or fly wheel square and toggles loose, broken balls, etc. But of course, as Dr. Hall says, he wants the right measurements for setting the valves which is very important as improperly set valves will invariably cause vibration. I would advise when he has the engine down to go over everything on the car for leaks and lost motion. Be sure about the pumps, as they perform a very important part in the regulations. Look for faulty checks, pitted balls, flat balls, loose seats, leaking stuffing boxes, too much lift, etc. In reseating the ball checks in the pumps, remove the caps and with a depth gauge measure the lift of the checks which should be for intake side 1-32 of an inch and for discharge 3-64. If too much lift, remove one or more of the gaskets from the cap nut; if not enough, file off the bottom of the cap nut until the desired lift is obtained. It is well to check up on such things occasionally as sometimes our cause of trouble is where we least expect to find it. Look to water regulator; disconnect by-pass and run engine neutral and see if it by-passes correctly. Excessive water consumption might be partly due to condensing system, that is, faulty condenser pump; condenser tubes dirty inside. To clean the condenser remove the exhaust chamber and bottom, thereby leaving the tubes exposed to be cleaned without removing from car. A White steamer should run at least five to seven hours on one tank of water. Now, I have spoken of a great many things and some that he no doubt already knows but with my experience at trouble shooting they are some of the things that very frequently gave us trouble.

He Uses a Kerosene Burner.

From Abner Dobbie, Massachusetts.—J. J. S. of Kentucky asks about burning kerosene and gasoline mixed in a Stanley car. I have experimented with the mixture, as well as kerosene straight with my Stanley Model 72.

I found that a mixture of 40 per cent. kerosene burned all right. The pilot required cleaning every day, and the vaporizing coil on top of the boiler seemed to heat the kerosene enough to make it form carbon which stuck up my main-burner valve and steam-automatic every few days. In fact it was far more bother than it was worth.

I am now using a kerosene burner which burns kerosene straight with good results. The burner was made by the J. L. Thompson Co. of Waltham, Mass. and burned kerosene in the pilot (or was supposed to when I bought it) I had so much bother with it that I soon used gasoline in the pilot, and now I have no more trouble than I had with the gasoline burner. The pilot will burn gasoline all right without change, but I changed mine over so that it is the same as a Stanley pilot so that I have no trouble at all. That is, I put a Stanley pilot needle on the end of the rod that runs through the pilot, and broached out the hole in the nozzle to fit, and at the other end I brazed a Stanley pilot-screw and tapped out the pilot to fit, so that I can unscrew and take out the needle without taking out the pilot which is a great convenience.

Kerosene and Gasoline.

From J. Harris Wight, Massachusetts.—In reply to J. J. S., Kentucky, I wish to say, kerosene and gasoline cannot be mixed so it will burn in a Stanley burner. The fuel will mix but cannot be burned without smoke and flooding as the pilot is not hot enough, but by making a pilot that will vaporize the fuel the

GARAGEMEN

MAKE BIG PROFITS WITH A

“NATIONAL” Garage Vulcanizer

WHY? Because the “NATIONAL” was designed by a man long connected with the largest tire factory on earth, and knew just what was needed to do the work *right* at the lowest possible cost. Vulcanizes Three Tubes and Two Casings at a time. Heated by either gas or gasoline.

The old complicated vulcanizers are things of the past. Our machine is so simple to operate that, with complete instructions furnished, any boy can do perfect work. Hundreds of our customers have written that they paid for the machine with the profits made the first few days. This machine is nothing new and untried, as it has been on the market nearly two years, and is made by one of the oldest and largest vulcanizer manufacturers on earth. Don't take a chance on a new article where the bad features have not been eliminated. We had them at first the same as everyone else.

SPECIAL OFFER!

We are running a very special offer at present which brings the actual cost of the machine way down within the reach of the smallest garage. We want one in every town in the U. S., and will put you in position to get one, even though your capital is small. Your credit is good with us

Regular Dealer's Price, complete with Full Instructions and Supplies to get started, \$45.00
but we want you to write for our *Big Bargain Offer at once.*

“NATIONAL” Portable Steam Vulcanizers For Individual Car Owners

Nearly 30,000 now in use. **Steam won't burn your tire.** For both tubes and casings of any size. **Send for one on ten days' trial.** If you find it worth much more than the price, keep it and send us \$12, or return the machine to us. You don't see any other manufacturer making this offer! They are afraid to, yet we have been making it for four years. Full instructions and all supplies with each outfit. **SEND FOR ONE NOW.**

THE NATIONAL MOTOR SUPPLY CO., FACTORY 1901 EUCLID AVE., CLEVELAND, O.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

kerosene will burn without the gasoline in it. There is nothing gained by mixing the same as I have experimented for several years along that line and can say I gained nothing. To burn oil one must use a burner that is made of light steel cast and sawed in slots. The light stamped plate burners will soon burn out or warp, and oil requires a good deal more air than gasoline. I have used oil in all my cars for twelve years with good results.

Kerosene Burners.

From a Stanley Car Owner, New York.—Last year we bought gasoline at 11 cents and now it costs 16 cents a gallon. Seems to me that some one could make a good kerosene generator that would sell. I know there are burners for sale, but \$50 is too much to pay for one, when as it seems to me, all that is needed is a generator and not a whole burner.

Can you tell me if the burners on a Stanley car are adjusted to use gasoline that tests 72? The gasoline we are now buying tests 54 to 56. Should the burners be adjusted to use more or less air? I used to get from 10 to 12 miles out of a gallon when now I am only getting 8 to 9, with four passengers. The tank full of water carries me 30 miles.

Do you know of any one who makes a kerosene generator that can be used in connection with the Stanley fire box?

I wish you could illustrate that New York man's quick change fusible plug he told about in a former issue.

Can any one tell your readers how kerosene will burn in the Stanley burners? I have read somewhere that by cutting out the coil on top of the boiler that it will run all right, and that too long heating tends to carbonize it.

The Pumps Pound.

From Harry W. Case, Connecticut.—I have used a Stanley Steamer for the past two seasons. Not a late model car, but one that has given us a great deal of pleasure, and runs as smoothly and still today as when it was new, with the exception of the pumps. When one, or both are on, they pound considerably. I have packed them both over new and put a new ball in the check valve, but they still pound, with the pumps not packed tightly. I have put on one new supply pipe (water) from the check valve to the boiler, making a duplicate of the old one. I have wondered if a supply pipe with one coil would reduce the pounding. The pumps seem to be in perfect condition in every way. When the bi-pass is open they run perfectly still. I have had years of experience around steam plants but have never had anything baffle me as this pounding does.

Cars In New York State.

It has been assumed by some of the newspapers that because fewer automobiles had taken out licenses than last year the number in use had decreased, and that to the extent of some 15,000.

This is not the case. June 14th there were licensed 85,300 cars against over 100,000 at the close of the year 1911, but there is still the balance of the year to hear from. There are more cars in use in the State at present than ever, and quite likely they will all take out their 1912 licenses long before the year is over.

Don't start too suddenly, and don't bring your car to a standstill within its own length unless circumstances call for it. Slow up gradually and preserve your tires.

A Motor Driven Horn for \$10.—The readers who are interested in obtaining an efficient motor driven signal should investigate the merits of the Newtowne Superior Motor Driven Horn which is being placed on the market at the popular price of \$10. This horn is not a cheap imitation of the best class of motor driven signals. On the contrary, it is made of the very best material and embodies the finest quality of electrical and mechanical construction. It is placed on the market with an unusually strong guarantee, and there should be little excuse for using the old type of

bulb horn when a first-class signal can be obtained at this very low price. Interested car owners should write for further particulars to the Automobile Supply Mfg. Co., 220 Taaffe Place, Brooklyn, N. Y., and in doing so mention this magazine. Car owners who specify the Newtowne Superior on their 1913 car will be sure of a good signal.

Dealers are particularly requested to write at once for the special offer of the Aermore Mfg. Co. Dept. 5546, 1536 Michigan Blvd., Chicago, Ill. See the full page announcement of the company

in this issue in which their Aermore Exhaust Horn is illustrated and described.

The New Esterline Starter.—This device is said to be unique in many ways and a rather radical departure from the electric starting devices now on the market. It is simple in construction and said to be reliable in operation. It is manufactured by the Esterline Company of Lafayette, Ind. This same company is bringing out a new electric lamp, which is said to possess the remarkable quality of giving a light which pierces through fog, mist and dust, but which is not blinding to the eyes.

"Time is the thing Life is made of"

said some one—Franklin, perhaps; he was always harping on the value of Time, and he always harped on it melodiously as well as truthfully. But speaking of the value of time, you can use ten minutes of it to no better purpose than reading the advertisements in this issue. You will be sure to learn something you never knew before, and quite likely it may be worth a good many dollars to you.

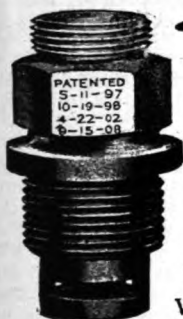
Mosler Spit Fire Plugs

STOP THAT FAKING

TO DECEIVE THE PUBLIC IS FAKING

For Over Ten Years We Have Been The Leading And Largest
Spark Plug Manufacturers In The United States.

NO ONE HAS EVER MANUFACTURED OR ASSEMBLED A MOSLER "SPIT-FIRE" PLUG



Our limited capacity,
and the tremendous

increasing demands made upon us for
Mosler's "Spit-Fire" Spark Plugs—

The Closed-end Plug—The Plug with the Deepest
Chamber—made it absolutely necessary for us to
ask the Screw Machine Parts Manufacturers
to make for us this part of our "Spit-Fire" Plug.



We gratefully acknowledge that in the past the various

screw machine companies made the above steel base for us, but that is all.

We absolutely brand as a deliberate false statement that any manufacturer or
screw machine manufacturer ever made or assembled for us a complete spark plug.

The manufacturing of a gas engine spark plug is no joke

but a carefully thought-out necessity;

that is why

Mosler "Spit-Fire" Plugs are found on more automobiles than any other plug made.

Ask the man who knows—Ask the man who uses spark plugs—

We manufacture the most satisfactory spark plug made to-day.

Our capacity, on account of our New Model Factory is unlimited.

We are now prepared to give to our customers absolute satisfaction and prompt deliveries.

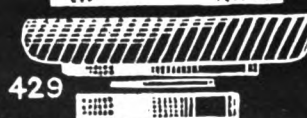
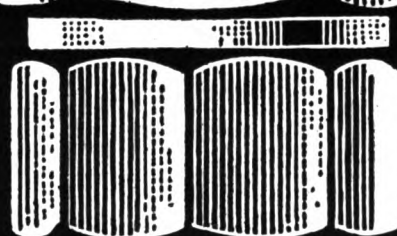
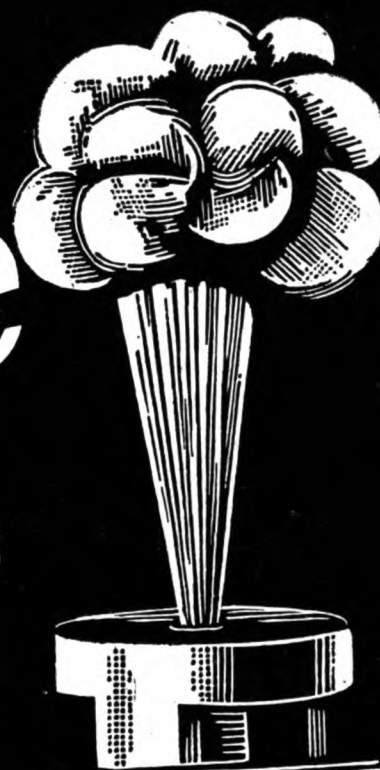
With our equipment of the very latest high speed multiple spindle automatic screw
machines, we guarantee Mosler "Spit-Fire" Plugs absolutely as to workmanship and material.

Our porcelains are the best money can buy

from the greatest porcelain manufacturers in the world.

Each and every Mosler "Spit-Fire" Spark Plug is made in Mosler's own factory.

exclusively used for the manufacture of Mosler Spark Plugs.



429

A.R. MOSLER & Co., P.O. BOX "M" MT. VERNON, N.Y.

WE OWN THE LARGEST FACTORY IN THE WORLD DEVOTED EXCLUSIVELY TO THE MANUFACTURE OF SPARK PLUGS

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Rubber Tire Plant Enlarging.—The Fiske Rubber Company are making extensive additions to their plant at Chicopee Falls, Mass., in order to take care of the increased demand for their automobile tires, tubes and bicycle tires. The addition to the plant will consist of two new buildings, one 250 feet long, 90 feet wide, with six stories and basement, and another building 200 feet long, 60 feet wide, with four stories and basement. It is expected that the new buildings will be completed and machinery installed by November 1st, 1912, and will give the plant an extra capacity which will necessitate the employment of six or seven hundred additional workmen.

New Selling Agency for Lee Tires.—We take pleasure in announcing the fact that Charles F. U. Kelly and Harry E. Field have organized the firm of Kelly-Field Co., and have opened for business at 1737 Broadway, New York City. This company will act as general sales agents for Lee tires, tubes and tire accessories manufactured by the Lee Tire & Rubber Co., at Conshohocken, Pa. The members of the Kelly-Field Co. are favorably known to the trade throughout the country. Mr. Kelly, the former president and principal organizer of the Kelly Racine Rubber Co., has been one of the best known tire men ever since bicycling days, having been connected earlier with the Hodgman Rubber Co. and the B. F. Goodrich Co. Mr. Field, who is president of the T. B. Jeffrey Co. of New York, was formerly vice-president and general sales manager of the Hartford Rubber Works Co. It is generally felt in the trade that the new company makes a very strong selling combination, and we understand that the sale of the Lee Puncture-Proof Tires will be vigorously pushed by the new company in the Metropolitan district and vicinity. In fact, our readers who may be interested in Lee tires may send their correspondence either to Kelly-Field Co., as above, or direct to the Lee Tire & Rubber Co. at Conshohocken, Pa., and in all correspondence please mention this magazine.

The Daisy Lighter.—The Simkin Mfg. Company, 1507 Michigan Avenue, Chicago, Ill., want live dealers and garage owners everywhere to handle the Daisy Lighter. They say it only needs to be shown and demonstrated to sell quickly, and it yields a good profit.

The Hudson Motor Cars are electrically self-starting and electric lighted. The "54" Hudson has qualities which should commend it to those desiring a car. But consult the full page announcement of the company in this issue and write for further particulars to the Hudson Motor Car Company, 7465 Jefferson avenue, Detroit, Mich.

Fox Typewriters.—Our readers in need of a typewriter should consult the advertisement of the Fox Typewriter Company, 6609 Front street, Grand Rapids, Mich., which will be found in our advertising columns. They sell their machines on very liberal terms and we can testify to their efficiency, as we have several in our office. Consult their advertisement and drop them a postal card or letter today before you forget about it.

Climatic Waterproof Garments.—These dependable garments to protect automobilists from the elements may be

obtained from the Climatic Raincoat Company, 102 Fifth avenue, New York City. This house has a heavy export trade and being compelled to specialize they are in a position to sell their goods, it is claimed, at 20 per cent. lower prices than many of their competitors. They guarantee fine workmanship, uniformity, and clean-cut, handsome garments. If your dealer does not keep this line of goods, you are invited to write direct to the Climatic Raincoat Company, 102 Fifth avenue, New York, for descriptive circulars, prices, etc. This house also has a special dealers' proposition, and they would like to have all dealers who read this publication get in touch with them for the coming season. In all correspondence mention The Automobile Dealer and Repairer.

Announcement has just been made of the incorporation of the A. W. Harris Oil Co. of Providence, R. I., on August 15. The new corporation will succeed the A. W. Harris Oil Co. which was formerly conducted by the late Mr. A. Walter Harris. The incorporators of the new company are Benjamin S. Terry, president; Arthur D. Greene, treasurer, and George F. Heywood, secretary. The capital stock is \$75,000. The company is incorporated under the laws of Rhode Island. The officers mentioned, have been connected with the A. W. Harris Oil Co. for a great many years. They were all associates of the late Mr. Harris and this very fact insures the continuance of the business along exactly the same lines that governed its policy for over a quarter of a century.

The "All-In-One" Spark Plug.—This is described by the manufacturers as powerful, sootless and durable. It is a combination plug and priming cup. To start your motor you simply pour a few drops of gasoline into the priming cup and crank your engine, which is a great convenience to the car owner. The retail price of the "All-In-One" Spark Plug is \$1.50. If your dealer does not keep this plug write direct to the Frontier Specialty Company, 732 Main Street, Buffalo, N. Y., and they will promptly fill your orders or give you full information.

Preserv-o Tire Paint.—This is a ready-to-use liquid rubber dressing for automobile tires. It is said to penetrate into every cut and crevice of the casing, leaving it entirely coated with a new, perfectly waterproof surface. It prevents decay of fabric and rubber, so the manufacturers say, and makes the tires last longer, besides giving them a bright, white and new appearance. This paint will not rub off. A pint can only costs 50 cents, and it is enough to coat six big tires. If your dealer doesn't have it, write to the manufacturers, Atlas Auto Supply Co., 77 E. Adams St., Chicago, Ill.

J & B Master Vibrator.—This device delivers a fat hot spark at the right time. The manufacturers say that it will insure that the charge in each cylinder will be fired when the piston is in the same relative position as the crank shaft. Uniform ignition prevents your engine from having that disagreeable pounding. Write for full particulars to the J & B Mfg. Company, Pittsfield, Mass., and see their announcement on another page.

To Sell R C H Cars.

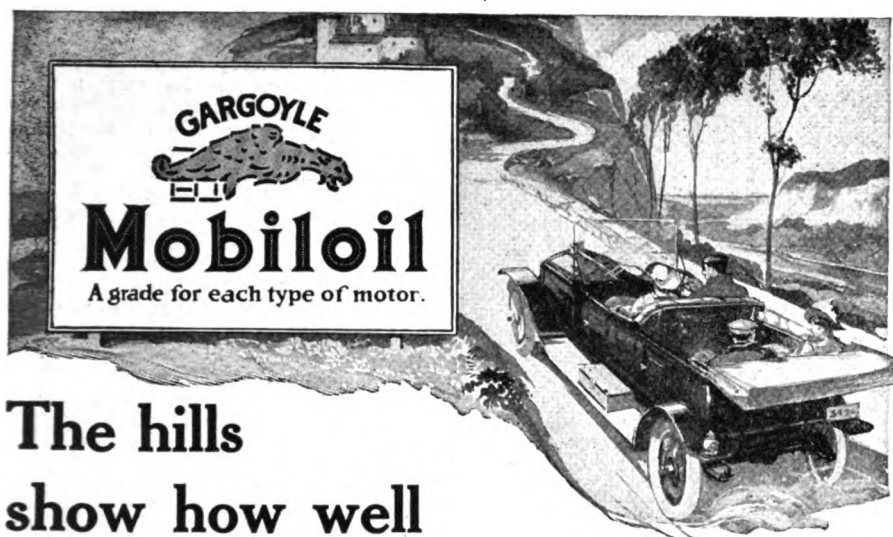
The R. C. H. Corporation of Detroit, Mich., has recently closed contracts with the following parties who will sell their cars.

Duncan G. Bellows, Zion City, Ill.
The Johnson Beattie Auto Co., So. Bend, Ind.
J. Carpenter, Ridgeville, Ind.
E. S. Crowder, Sullivan, Ind.
Levi J. Orr, Boswell, Ind.
R. W. Squires, Plattsburg, N. Y.
G. C. Walker, Granville, N. Y.
New Brunswick Garage Co., New Brunswick, N. J.
F. P. Venable, Paterson, N. J.
Franklin Auto Co., Elizabeth, N. J.
Thomas Motor Car Co., Somerville, N. J.
A. W. Sibley, Norton, Mass.
City Hall Garage, Lowell, Mass.
J. P. Plunkett, Red Lodge, Mont.
B. N. Engle, Enderlin, N. D.
R. H. Davis & L. P. Turney, Dalias, Tex.
Samuel E. Cass, Haverhill, Mass.
Louis G. Schoepflin Co., Buffalo, N. Y. (Hupp-Years.)
R. Haas Elec. & Mfg. Co., Springfield, Ill.
Knueppel & Ott, Davenport, Ia.
W. F. Wittmus, Harvard, Ill.
V. W. Prime, Elizabethtown, N. Y.
J. A. Pinkston, Independence, Kan.
Worthington Auto Co., Aberdeen, S. D.
A. F. Lauzon & Co., Burlington, Vt.
C. O. Scranton, Alliance, O.
Clark & Smith, Whitestown, Ind.
John G. Gelmiers, Chatsworth, Ill.
R. Kloeppel, 415 W. Adams St., Jacksonville, Fla.

The Michigan "40."—This car seems to be creating quite a sensation. The ablest engineers have spent four years to make it perfect and the claim is that they have succeeded. Since the start was begun on it, over 300 improvements have been made and as many as 71 in the past year. Every part and detail of this car is in charge of an expert who was the ablest man the firm could find for the purpose. It has every feature that can be found in any up-to-date car no matter what the price is, including oversized tires, four speeds forward, electric light and a motor that gives nearer 45 than 40 horse-power. The car sells for but \$1585. What the manufacturers desire more than anything else is that prospective buyers go at once to the local dealer and get them to demonstrate. They will send an extremely comprehensive catalog, however, by addressing the Michigan Motor Car Company, Kalamazoo, Michigan.

Car-owners.—Our readers who may be interested in a satisfactory horn are requested to write at once to the Aermore Mfg. Co. Dept. 5546, 1536 Michigan Blvd., Chicago, Ill., for their free booklet, giving full particulars of the Aermore Exhaust Horn. These horns are sold at reasonable prices and have special advantages described in the full page advertisement of the company in this issue.

Dealers.—The Start-Lite Company, 1502 P Michigan Avenue, Chicago, Ill., have a full page announcement in this issue descriptive of their Start-Lite Junior, which they want every dealer in the country to become acquainted with. Turn to their advertisement and write at once for special terms.



The hills show how well your lubricant suits your car

With the wrong oil your motor must overcome both the hill and the faulty lubrication.

You will find that the correct oil carries you much more easily over the hills at high speed. On heavy roads the correct oil will yield more power, and give freedom from pounding and over-heated motors.

Even the best of motors sometimes give trouble on a hard hill or sandy road. Under these conditions the help given by correct lubrication is noticeable.

Different types of motor demand different grades of oil. By a thorough analysis of various cars, we have prepared a complete lubricating schedule (printed in part on the right). It gives the grade of oil that will yield the greatest power from your motor. It will be sent you on request.

In power-engineering circles these recommendations from us would be accepted as authoritative. You may feel assured that, in quality, the oils specified on the chart set a world standard.

They are put up in 1 and 5-gallon sealed white cans, in half-barrels and barrels.

To the Trade

By carrying Gargoyle Mobiloils, with our chart of recommendations, you can say to the driver of any car: "I can give you the correct grade of oil for your car. It is recommended by the Vacuum Oil Company—the recognized leaders in lubrication."

By handling Gargoyle Mobiloils you also get the benefit of the strongest advertising

The oils (refined and filtered to remove free carbon) are named:

- Gargoyle Mobiloil "A."
- Gargoyle Mobiloil "B."
- Gargoyle Mobiloil "D."
- Gargoyle Mobiloil "E."
- Gargoyle Mobiloil "Arctic."

All are branded with the Gargoyle, which is our mark of manufacture.

campaign ever run for automobile lubricants. Following our campaign of large-space advertisements in the Saturday Evening Post, Collier's, Literary Digest, Life and Scientific American, we will run a Fall campaign in leading monthly magazines. Our advertising in ten leading automobile magazines will continue.

VACUUM OIL CO., Rochester, U. S. A.

General Sales Offices, 29 Broadway, New York City.

Distributing warehouses in the principal cities of the world.

A guide to correct automobile lubrication

Explanation: In the schedule the letter opposite the car indicates the grade of Gargoyle Mobiloil that should be used. For example, "A" means "Gargoyle Mobiloil A," "Arc" means "Gargoyle Mobiloil Arctic." For all electric vehicles use Gargoyle Mobiloil A. The recommendations cover both pleasure and commercial vehicles unless otherwise noted

MODEL OF CARS	1908	1909	1910	1911	1912
Abbott Detroit	A	Arc	A	Arc	A
Abbott Detroit	A	Arc	A	Arc	A
Alexander	A	Arc	A	Arc	A
American	A	Arc	A	Arc	A
Apperson	A	Arc	A	Arc	A
Atlas	A	Arc	A	Arc	A
Com'l	A	Arc	A	Arc	A
Austin	A	Arc	A	Arc	A
Autocar (2 cyl)	A	Arc	A	Arc	A
" (2 cyl) Com'l	A	Arc	A	Arc	A
" (4 cyl)	A	Arc	A	Arc	A
Benz	A	Arc	A	Arc	A
Bergdoll	A	Arc	A	Arc	A
Brum	A	Arc	A	Arc	A
Buick (2 cyl)	A	Arc	A	Arc	A
" (4 cyl)	A	Arc	A	Arc	A
Cadillac (1 cyl)	A	Arc	A	Arc	A
" (4 cyl)	A	Arc	A	Arc	A
Carters	A	Arc	A	Arc	A
Com'l	A	Arc	A	Arc	A
Casa	A	Arc	A	Arc	A
Chadwick	A	Arc	A	Arc	A
Chalmers	A	Arc	A	Arc	A
Chase	A	Arc	A	Arc	A
Cole	A	Arc	A	Arc	A
Columbia	A	Arc	A	Arc	A
Columbia Knight	A	Arc	A	Arc	A
Coupe Gear	A	Arc	A	Arc	A
Croton-Keston	A	Arc	A	Arc	A
Daimler	A	Arc	A	Arc	A
Daimler Knight	A	Arc	A	Arc	A
Darracq	A	Arc	A	Arc	A
De Dion	A	Arc	A	Arc	A
Delahaye	A	Arc	A	Arc	A
Delaney-Belleville	A	Arc	A	Arc	A
Elmore	A	Arc	A	Arc	A
E. M. F.	A	Arc	A	Arc	A
Flinders	A	Arc	A	Arc	A
Ford	A	Arc	A	Arc	A
Franklin	A	Arc	A	Arc	A
Com'l	A	Arc	A	Arc	A
Gramm	A	Arc	A	Arc	A
Gramm-Logan	A	Arc	A	Arc	A
Hewitt (2 cyl)	A	Arc	A	Arc	A
Hewitt (4 cyl)	A	Arc	A	Arc	A
Hudson	A	Arc	A	Arc	A
Hupmobile	A	Arc	A	Arc	A
International	A	Arc	A	Arc	A
Interstate	A	Arc	A	Arc	A
Isotta	A	Arc	A	Arc	A
Itala	A	Arc	A	Arc	A
Jackson (2 cyl)	A	Arc	A	Arc	A
" (4 cyl)	A	Arc	A	Arc	A
Kelly	A	Arc	A	Arc	A
Kiesel-Kar	A	Arc	A	Arc	A
Com'l	A	Arc	A	Arc	A
Kline-Kar	A	Arc	A	Arc	A
Knox	A	Arc	A	Arc	A
Krit	A	Arc	A	Arc	A
Lambert	A	Arc	A	Arc	A
Com'l	A	Arc	A	Arc	A
Lancia	A	Arc	A	Arc	A
Locomobile	A	Arc	A	Arc	A
Lozier	A	Arc	A	Arc	A
Mack	A	Arc	A	Arc	A
Marion	A	Arc	A	Arc	A
Marmos	A	Arc	A	Arc	A
Matheson	A	Arc	A	Arc	A
Maxwell (2 cyl)	A	Arc	A	Arc	A
" (4 cyl)	A	Arc	A	Arc	A
Mercedes	A	Arc	A	Arc	A
Mercedes Knight	A	Arc	A	Arc	A
Mercur	A	Arc	A	Arc	A
Adinerva Knight	A	Arc	A	Arc	A
Mitchell	A	Arc	A	Arc	A
Moore	A	Arc	A	Arc	A
National	A	Arc	A	Arc	A
Oakland	A	Arc	A	Arc	A
Oldsmobile	A	Arc	A	Arc	A
Overland	A	Arc	A	Arc	A
Packard	A	Arc	A	Arc	A
Panhard	A	Arc	A	Arc	A
Panhard Knight	A	Arc	A	Arc	A
Peerless	A	Arc	A	Arc	A
Pennsylvania	A	Arc	A	Arc	A
Pierce Arrow	A	Arc	A	Arc	A
Com'l	A	Arc	A	Arc	A
Pope Hartford	A	Arc	A	Arc	A
Premier	A	Arc	A	Arc	A
Rambler	A	Arc	A	Arc	A
Rapid	A	Arc	A	Arc	A
Regal	A	Arc	A	Arc	A
Renault	A	Arc	A	Arc	A
Reo	A	Arc	A	Arc	A
Royal Tourist	A	Arc	A	Arc	A
Selden	A	Arc	A	Arc	A
Simplex	A	Arc	A	Arc	A
Speedwell	A	Arc	A	Arc	A
Stacy	A	Arc	A	Arc	A
Stearns	A	Arc	A	Arc	A
Stearns Knight	A	Arc	A	Arc	A
Stevens Duryea	A	Arc	A	Arc	A
Stoddard Dayton	A	Arc	A	Arc	A
Stoddard Dayton-Knight	A	Arc	A	Arc	A
Thomas	A	Arc	A	Arc	A
Walter	A	Arc	A	Arc	A
Welch	A	Arc	A	Arc	A
Welch Detroit	A	Arc	A	Arc	A
White (Gas)	A	Arc	A	Arc	A
White (Steam)	A	Arc	A	Arc	A
Winona	A	Arc	A	Arc	A

The Leasure Sanitary Eye and Nose Shield.—This is a new article, which is likely to be very popular among car owners everywhere. The cumbersome unsightly goggle is discarded, yet the eyes and nose are perfectly protected from dust and the eyes are also protected from glare. The fact that distinguishes this shield from all others is the silk gauze covering the nostril. This is patented and cannot be used on other shields. It is a sanitary device of great importance to the autoist, as it protects the nasal passages from the inhalation of poisonous dust particles that may generate incurable diseases. No glass is used; but the transparent portion of the shield is made of a fine quality of transparent celluloid. This transparent portion is made in plain amber, blue or green colors. The shield is trimmed in colored leather or ribbon and the whole device is packed in a neat leather case. In spite of its many desirable features, the price of the Leasure Shield is only one dollar and it will be sent prepaid on the receipt of price anywhere in the country. Address your orders and inquiries to the Sanitary Sales Company, Bradford, Pa., and mention this magazine.

The Red Head Platinum Point Magneto Plug.

After nearly one year of experiment at the hands of ignition experts, the red head platinum point magneto plug is at the service of spark plug users. For the information of those whose curiosity has been aroused by the unique card which

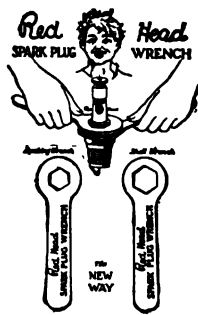


The New Red Head Plug.

was mailed to the trade to announce its birth on July 4, and by the memory-teasing bullet-shaped advertisements which have been scattered throughout the advertising pages of trade journals since the happy event, it may be stated that the latest addition to the happy family of Red Heads bear a striking physical resemblance to its older broth-

ers. To avoid confusion, the platinum point plug has been marketed with a double-dipped and highly polished nickel-plated shell, bushing and cap. This finish harmonizes with the nickel-plated trim of high-powered motors, for which service the platinum point plug is destined by the Emil Grossman Company, 250 W. 54th St., New York City.

Of course, the plug bases its middle names upon the fact that the center electrode has a solid platinum point. One of the reasons why this plug has been so long in making its appearance is that



The Red Head Wrench Set.

it took months to perfect the process for welding the platinum cap to the center electrode. The modern super-high tension magneto, which is the equipment of powerful 1913 cars delivers a spark sufficiently hot to fuse any metal except platinum 100 per cent. pure. As the liberal use of this grade of platinum (which is more costly than the purest gold) indicates, no expense has been spared to bring the Red Head Platinum Point Plug up to the high state of efficiency developed through a rich racing experience.

Another innovation is a combination screw top and magneto type terminal. This terminal will accommodate snap, ring or slip cable connections of all sizes and designs. And the Red Head porcelain has given such splendid evidence of its stamina, in heated racing and pleasure cars, that no room for improvements in quality or design was possible. To give further individuality to this plug, a torpedo-shaped telescopic box with silver and black label and red top, has been adopted. The plug threads into a cavity in the base of the container, thus protecting the points and preventing any disarrangement of the spark gap.

The plug retails at \$2.00, and all dealers will furnish one set of Red Head Spark Plug Wrenches with every four plugs, free.

The New York Coil Company, 338 Pearl Street, New York City, manufacturers of the well known line of spark coils for ignition and lighting as well as the Rhoades' Unit Spark System early recognized the extreme difficulty of adjusting the four separate vibrator coils to produce a spark in all of the cylinders at the same crank shaft angle. After a great amount of research the now famous New York Master Vibrator was placed on the market and proved a perfect solution for thousands experiencing faulty ignition. Several years ago this instrument was redesigned to operate on the Ford alternating current, magneto as well as battery, with the result that starting is made easy, adjustment greatly simplified and more power

is claimed. Anyone can install the device in a few minutes by simply fastening to the dash and changing two wire connections. The current from the magneto or battery is first passed through vibrators on its way to the regular coils (the vibrators of which are screwed down tight). The regular timer and coils are not disturbed in any way. Interesting and instructive literature will be sent to all readers of this journal upon request. Their advertisement appears elsewhere in this magazine. Mention this publication when writing to them.

Do Your Gas Pipe Lines Leak?—The result of a series of tests for leaky pipes has led the Prest-O-Lite Company to establish a service station in each of the cities where the company now has a branch office. These stations are equipped to give free service to gas tank users in locating leaks and showing them how to deliver the full capacity of each tank to the lamps.

As not every owner has access to one of these service stations, Carl G. Fisher, president of the Prest-O-Lite Company, gives the following directions for testing pipe lines: Leaking pipe lines are a frequent source of waste. Complaints of short measure, and excessive gas consumption are always traceable to leaks. The peculiar feature of this is that if the owner will spend but a few moments in testing the tubing from the tank to the lamp, the waste will be eliminated, and in many cases the life of each tank of gas will be doubled.

"First, disconnect the rubber tubing at the lamps, and pinch or clamp the ends tightly. Go over every inch of the rubber and brass tubing, and each connection with heavy soap-suds, seeing that every portion is thoroughly covered with it. Then turn on the gas. A leak at any place will be shown at once by the formation of a bubble. If it is formed at a connection, this should be tightened at once. If the bubble appears on any portion of the tubing (either rubber or brass) it is a sign that the tubing should be replaced or repaired.

"The places where the rubber is joined to the brass tubing should be watched carefully. Wherever the brass tubing is run through the frame or mud apron, it should be protected from wear. Very often leaks are found at such spots. The rubber tubing, however, is the worst offender and a few cents spent in putting in new rubber connections will often pay for itself many times over in gas saved. When all of the tubing and joints have been tested and connections to the lamps, the lamps themselves should be tried for leaks. Put soap-suds around the base of the tip and on the stem which holds the tip and on the rubber tube joint at the lamps. Then turn on the gas and light the lamps. If bubbles appear at the joint in the stem inside the lamp, this stem should be unscrewed and the threads covered with white lead.

"Every automobile owner should make this simple test, whether he suspects a loss of gas from leaks or not—and it should be done three or four times a year, at least. Free service is also given in making any needed adjustments on the Prest-O-Starter, the Prest-O-Liter and other Prest-O-Lite products."

Subscribe to the "Automobile Dealer and Repairer," \$1.00 Per Year.



END YOUR TIRE TROUBLES FOREVER

You may have seen Puncture
Proof Tires or You may have seen Tires
Guaranteed for 5,000 Miles

—BUT—

The Aer-Oid Casings Equipped with our Aer-Oid Cores

are both guaranteed 5,000 Miles and Puncture Proof Forever

These Guaranteed Puncture-Proof Tires cost only slightly more complete than your ordinary tires and tubes. For example, the prices on 36x4" tires complete are as follows:

Ordinary Pneumatic Tire

Casing, \$44.15
2 Tubes, 16.20
\$60.35

Guaranteed only 3500 miles.
No guarantee against trouble.

Aer-Oid

\$23.00

Aer-Oid

Casing, \$42.50
Core, 23.00
\$65.50

Guaranteed for 5000 miles.
Guaranteed Puncture-Proof.

No inner tubes are necessary for Aer-Oid Puncture-Proof Tires with Aer-Oid Cores. The core can be used again in a new tire after the first casing is worn out. Anyone can mount these tires anywhere.

Special Introductory Offer

Sample pair of any size Aer-Oid Puncture-Proof Casing with Aer-Oid Core, complete, at approximately price of one pneumatic casing and one inner tube of the size you need. Write us for quotation, stating size you use and the kind of rims on your car. This special introductory offer is limited and we reserve the right to withdraw same at any date without notice. Better act to-day.

Easiest Riding Tire Core Made

Aer-Oid is the easiest riding and most resilient tire core made. It is absolutely unaffected by heat till long after rubber burns up. Will not crumble, get hard, soft, flat, or lose its life and resiliency as long as it is properly protected by the tire casing. We have yet to find its exact length of life as it seems to retain its efficiency indefinitely.

To Owners with Demountable Rims

We will ship you an Aer-Oid Puncture-Proof Tire with Core mounted on the make of demountable rim you use. This saves you all installation bother. No extra charge for rim if you will return one demountable rim pre-paid when you receive yours. State make of your rim, size of tire, and send deposit of \$10.00 for 3" or 3½" tire, or \$20.00 for 4" or larger tires. We will then ship new tire, core and rim complete by return express. Better make it a pair if you can use them, before the offer is withdrawn.

A WORD TO DEALERS

Perfecting methods of installation and handling "Aer-Oid," together with the sale of the Casing which wears out, as well as the Core—and a good discount on each with a 5000 mile guarantee—makes a Combination Agents' proposition, which is ages ahead of any other Tire Filler proposition on the market. Better come in while you CAN.

AER-OID SALES CO., Dept. B, 1777 Broadway, New York

A Reservoir Grease Pump.

An entirely new accessory article is being put on the market by the Delta Manufacturing Company of Bloomfield, N. J., which is illustrated herewith. It is called by the manufacturers a "Reservoir Grease Pump," and it will certainly fill a long felt want in any private or public garage, as it is a storage can and grease can combined.

It has all the advantages of the old grease gun and the user does not come in contact with the grease at all, and is not bothered with the repeated filling and emptying of a small grease gun which is always a tedious operation and a dirty one. It is also a great time-saver.

The can, as shown in the cut, is a galvanized steel tank 8 inches in diam-



The Delta Reservoir Grease Pump.

eter and 18 inches high and it will hold 25 pounds of grease. Attached to the side is a specially constructed double acting long stroke brass pump, that draws the grease from the can and delivers it through a five foot flexible metal oil-tight hose or nozzle.

This hose has a swivel tip that will reach anywhere around the automobile. There is a cover to keep out the dirt and a handle for carrying, and a foot rest to steady it when in use. The whole apparatus is enamelled in two colors, with polished brass trimmings, which gives it a very attractive appearance. The pump will handle any of the light greases or non-fluid oils such as are used in transmissions and differentials. The retail price of this device is \$15, and if your dealer does not carry it in stock, it will be delivered at this price free of all transportation charges anywhere in the United States, except Alaska. An illustrated circular will be sent on request. Send your orders and inquiries to the Delta Mfg. Company, Bloomfield, N. J., and mention this paper.

Carbo-Light Tanks.—The Carbo-Light Company of Pittsburgh, Pa., have an announcement in this issue descriptive of their Carbo-Light Tanks. They are said to furnish a clean steady white flame for two auto lamps at a cost of one cent an hour. You have your choice of nickel or copper finish. Can be re-charged anywhere, any time. It is automatic in action, low pressure and safe. Write at once for dealers' proposition and special discounts. Free literature will be sent to anyone asking for it, and they request that you write for "Polly Ann." We don't know who "Polly Ann" is or why you should write for her, but probably it will pay you to do so.

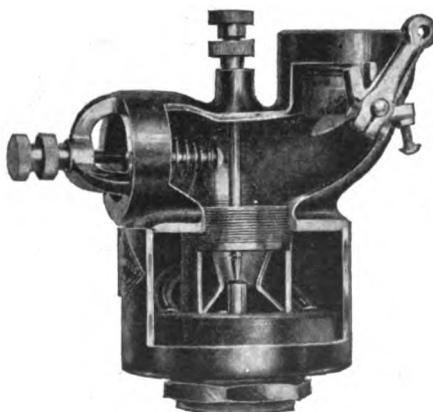
Repair Patch for Punctures.—There are two requisites for a patch that is designed to repair punctures. One is that it will stay on and do the work and the other is that in putting on may be done quickly. As will be noticed on another page of this issue, a new patch has been put on the market called the Horsey No Cement Patch. No repair kit is needed to use this patch. The work may be done quickly and without mussing the clothes or fingers, and it is claimed that it will last as long as the tube, while the greater the heat the tighter it will stick. Anything of this sort has long been needed and it should have a wide sale. It should be understood that this patch vulcanizes itself and thus saves time and trouble. A flat tin box containing twelve assorted patches, with sand paper and cloth, will be mailed on receipt of one dollar. Address the Horsey Manufacturing Company, 5606 Euclid Avenue, Cleveland, Ohio.

Try It Free For Thirty Days.

We wish to call special attention to the remarkable offer made in our advertising columns this month by the Motor Appliance Co. of America, 74 Warren Street, New York City.

They will send to any car owner one of their "Maco" Carburetors on thirty days' free trial, without involving the slightest obligation to purchase. If you want to try the "Maco" send no money, but mention this magazine and give the make and other particulars concerning your car, and the carburetor will be promptly sent to you. If not satisfactory after 30 days' trial, or if not wanted for any reason, it will be your privilege to return the carburetor and the manufacturers will find no fault. Could there be a fairer or more generous offer?

As to the carburetor itself the main object of the designers of the "Maco" has been to produce a carburetor that



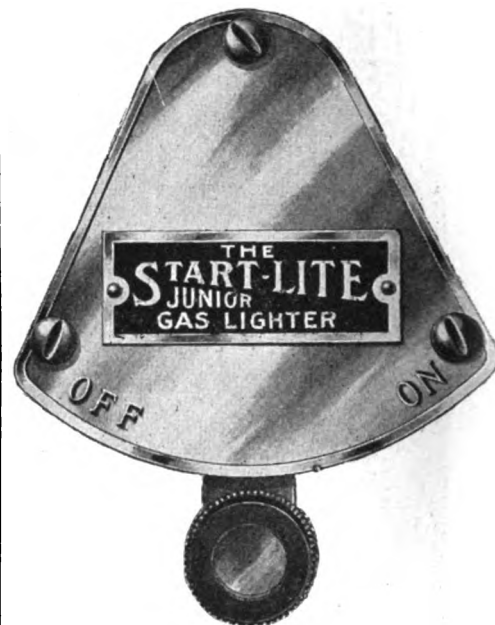
The Maco Carburetor.

the average car owner could not fail to understand and that could be adjusted so as to get maximum efficiency with least amount of adjustment. There are but two adjustments, the gasoline for low speed, and the auxiliary air for high speed, and these once regulated become permanent. The float chamber is radial, and the spray nozzle is directly in the center, which insures a constant fuel level in any position of the engine. The venturi tube in the constant air supply is so placed as to insure a good charge of gasoline, and breaking it up into the finest possible spray. The needle valve

adjustment is at the top. It is suitable for any type of engine, whether two or four cycle, marine, automobile or stationary.

A Gas Lamp Lighter at a Low Price.

—Very many of our readers will be interested in the full page announcement in this issue of the Start-Lite Company, 1502 P Michigan Avenue, Chicago, Ill.,



to be found in this issue. They present in their announcement 12 reasons why your car is not complete without a Start-Lite Junior. Consult these reasons and then write for full particulars and prices.

The Gasoline Automobile and Care and Operation of Automobiles. American School of Correspondence, publishers, Chicago, Ill.

The American School of Correspondence of Chicago have just published two books, one being upon the gasoline automobile and the other upon its care and operation. The first named work is intended to meet the need for an authoritative and reliable presentation of the mechanism of the gasoline motor and its achievements and also some of the newer features of the modern car. The last named volume is a practical handbook intended for the car owner who is his own chauffeur and mechanic and who wishes information on the subject of driving and repairs without going too much into what may be called the science of the matter. These books are both simple enough for the ordinary mind to comprehend and thorough enough for the trained worker. It is true that some topics are omitted, but the chances are a man might own a car for a life-time and never feel in need of any more information than he has at hand in these home study books. Each book is copiously illustrated with line drawings and half-tone cuts, and the printing, binding and paper are all that can be desired. The price of the "Gasoline Automobile" is \$2.00, and that of the "Care and Operation of Automobiles" is \$1.00, post paid. They may be had by sending to the foregoing address or if desired they will be sent from this office on receipt of price.

YOU CAN COUNT THE SAVING IN COLD CASH

Do you value time in repairing tires?

If so you will appreciate the simple steps of the Vulcum process, requiring but a few minutes—not more than five minutes actual working time.

"VULCUM" TIRE REPAIR OUTFIT

the only scientific process. It has a "Softener" to soften the old rubber to be repaired, a "Repairer," and "Vulcum," which fills the holes, and a "Hardener" to toughen the finished repair, all necessary.

IT WILL SAVE YOU MONEY

We will make a liberal guarantee to refund money if VULCUM is not satisfactory in every way, if it does not save you money and make your tire work easier whether in the shop or on the road.

The only process on the market that contains all the elements of success. NO TOOLS NEEDED. ONE-TENTH THE COST.

YOU GET MORE FOR YOUR MONEY in Quality, Quantity and Results.

Send \$2 Today. We will ship you immediately an Outfit for 50 Guaranteed Repairs so you can see for yourself.

Ask for our Agency Proposition, "MONEY BACK GUARANTEE."

NOTE:—Be sure and get our improved "Vulcum" outfit. It comes only in a substantial wooden Box.

**FOR PROMPT ATTENTION ADDRESS
VULCUM MANAGER,
Richardson Tire Co.,
Hartford, Conn.**



A New Spark Plug.

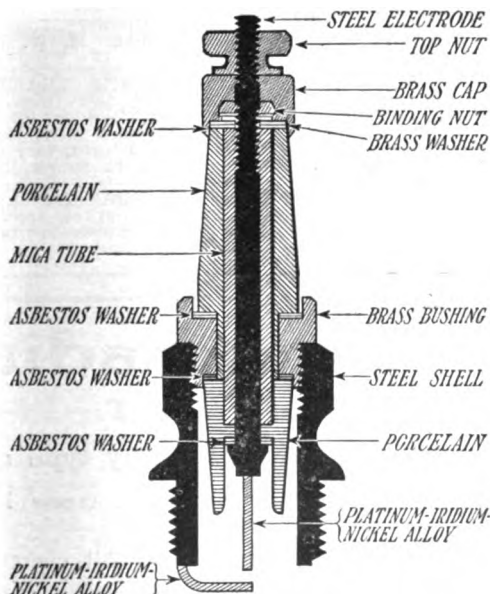
The J-M Spark Plug shown in the accompanying illustrations is a new one combining the desirable features of both the all-porcelain and the all-mica types

paired, even when current is supplied by a high-tension magneto. There are essentially but two parts to be handled by the user—the shell of steel which threads into the engine, and the electrode unit,

The mica tube is protected from oil, water and possible disintegration by a substantial porcelain thoroughly kilned and glazed. The porcelain also adds to the insulating value of the plug and provides an exterior finish to the electrode unit which can not be readily bruised or weakened. The outer or ignition end of the plug is fitted with a substantial brass cap surmounting the porcelain and protecting it from injury. Ample asbestos washer packing is provided at both ends of the porcelain to insure perfect non-leaking joints, and to allow for the unequal expansion and contraction of the different parts. The firing points are both made of an alloy of platinum, iridium and nickel. They will not fuse, pit excessively or readily "carbonize." Generally, the points need no adjusting, but the gap can readily and quickly be modified as occasion demands for either battery and coil, or magneto service, or for both.

Every J-M Spark Plug is guaranteed perfect in material and workmanship by the H. W. Johns-Manville Co., New York. Defective Plugs are replaced free of charge.

Graphite and Its Uses.—The Jos. Dixon Crucible Company of Jersey City, N. J., publish a little monthly called "Graphite" which contains much information of value in connection with the lubrication of machinery of all kinds. Our readers who may be interested can have a copy of this publication by writing to the company as above. Graphite is used in many ways in connection with automobiles.



Sectional View of the "J-M" Spark Plug.

by a judicious use of both mica and porcelain for insulation. The J-M Plug is designed to prevent short-circuit or trouble likely to be caused by oil, water and carbon. If the porcelain becomes broken, its sparking ability is not im-

paired, even when current is supplied by a high-tension magneto. There are essentially but two parts to be handled by the user—the shell of steel which threads into the engine, and the electrode unit,

Classified Advertisements

Under this head will be printed advertisements of **Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines For Sale or to Exchange**, at the uniform price of three cents a word, including the name and address, for each insertion, payable in advance. No advertisement will be inserted for less than 50 cents, however small. Remittances may be made in postage stamps or in any convenient way.

Classified Advertisements

Address **MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.**

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 323 West 57th St., N. Y. City.

PATENTS SECURED—C. L. Parker, Patent attorney, 962 G Street, Washington, D. C. Inventor's handbook upon request.

BROKEN CRANKSHAFTS, cylinders, crankcases, flywheels, gear teeth, pistons, perfectly welded and machined ready to replace. Guaranteed and references. Machinery up to 5 tons welded. Atlas Welding Works, 7476-78 Irving St., Rahway, N. J.

TOPS—Until further notice, runabout top \$22, touring car tops \$35. C. G. Meyer & Son, Tiffin, Ohio.

CYLINDERS REGROUND, and fitted with new pistons and rings for \$15.00 per cylinder. We make parts and cut gears of all kinds. Send us your old parts and we will repair or duplicate them in record time. Cracked cylinders, gear cases, etc., welded and made good as new. Aluminum, bronze and brass castings of every description, Phosphor bronze bushings in the rough carried in stock. Address, The Adapt Machinery Company, 1624 Wabash avenue, Chicago, Ill.

DON'T FORGET.

FORD AGENTS—WE MAKE A SPECIALTY of Dust Hoods to cover Top when clashed down for Model T Ford 1910-1911-1912 Cars. Write for prices, also Cellulosa, best Substitute for Glass used in Automobile and Buggy Storm Fronts, Side Curtains, etc., Sheets 20 x 36 in. 86c., 12 x 20 in. 36c., 18 x 20 in. 45c., 20 x 24 in. 68c., postpaid. Haews Storm Front Co., Coldwater, Mich.

AUTOMOBILE boilers bought, sold and repaired. Lucas & Son, Bridgeport, Conn.

MODEL T FORD OWNERS—You need my valve adjusters. They make a good car better. More power, better mileage, less noise. A good proposition to owner agents. Ira Lavender, Webster City, Iowa.

N. E. AUTO LIST—Weekly registrations of all N. E. States as reported, \$10 yearly, year book \$3. Auto List Co., 138 Pearl St., Boston.

500 NEW pressed steel auto frames 163 in. long, 38 in. wide. Send for sketch. \$10.00 each. Lucas & Son, Bridgeport, Conn.

BROKEN CYLINDERS AND CRANKCASES welded expertly and guaranteed. See our adv., page 16, for details. Waterbury Welding Company, Waterbury, Conn.

BRAND NEW 1912 AUTOMOBILES, ANY MAKE, ANY MODEL, fully guaranteed, \$50 to \$500 less than regular prices. State make wanted. Referenced agent wanted in every town. Owners! Get our Selling-Cost-Eliminated prices for tires and accessories. The Union Motor Sales Co., 6 CPA., Dayton, Ohio.

FOR SALE—Shumard's Patent full elliptic front spring outfit for Ford cars, 2000 sets sold first year. A great seller. Patent rights, jigs and stock. Cannot take proper care of this owing to other pressing business. Address, E. C. Shumard, 216 Webster St., Cincinnati, Ohio.

TIRE BARGAINS!—A. C. C. A. Prices Talk! Diamond, Goodrich, and other standard makes. Guaranteed. Every size for every rim.

28x3—\$6.00 32x3—\$8.00 28x3½—\$9.25
30x3—7.00 34x3—9.00 29x3½—10.00
Also all other sizes and Tubes proportionately low. Shipped on approval. Also 1000 motor cycle tires sacrificed. Write today for Price List. The Automobile and Cycle Company of America, Dept. Six, 1769 to 1787 Broadway, New York City.

AUTOMOBILES—A. C. C. A. Prices talk! Every make, every model. Hundreds runabouts, racy roadsters, five seven-passenger touring cars, \$50 up. Guaranteed five years. Shipped freight prepaid! Write today for largest Illustrated Catalog published! The Automobile and Cycle Company of America, Dept. Five, 1769-1787 Broadway, New York City.

DELIVERY CAR, closed body, 10 h. p.; just spent \$100 overhauling, \$150 new body and painting; will sell \$200. Chatfield, 312 W. 52d St., N. Y. City. (Telephone).

PORTABLE GARAGES

Garages—Portable-permanent, steel or wood. Knapp System, 123 Liberty St., New York City, N. Y.

CYLINDERS REBORED, pistons and rings fitted, gear cutting of all kinds and materials, transmission and bev. gears of nickel steel hardened and tempered, guaranteed better than factory, crank shafts, connecting rods, crank cases, axles, any part of auto or motor reproduced like original, phosphor bronze bushings carried in stock, send old or broken parts to go by. The shop of quality, McCadden Machine Works, Minneapolis Branch, Minneapolis, Minn.

WELDING—\$\$\$\$\$\$ saved on auto parts. Ship all broken castings to us. Save time and \$\$\$\$\$\$. National Welding & Mfg. Co., Incorporated, Mfrs. of Complete Welding Plants, Welders and Brazers of all Metals, 526 Jackson Blvd., Chicago, Ill.

WHEN your tires or tubes need repairing, send them to us. Our prices are lowest, we are always prompt and reliable. We sell all kinds of tires and accessories at special prices. It will pay you to "Get Acquainted." New York Steam Auto Tire Works, 312 West 52nd St., New York City.

FORD DEALERS AND OWNERS—We can save you money on top dust hoods. C. G. Meyer & Son, Tiffin, O.

WE BOUGHT at bargain from bankrupt factory 500 mohair tops, \$40.00 kind will sell at \$10.00 each cash, complete with curtains, covers and wind shields. This price will move quick so get your order in early. Address Puritan Machine Company, 51 10th St., Detroit, Mich.

FOR SALE—Ammeters, 1000, watch size, nickel plated, guaranteed. Battery testers in chamois leather cases. Read 0-30 amperes, 25c., postpaid. Stamps taken. E. W. Electrical Co., 3525 Broadway, New York.

FORD OWNERS! Order a Hough Whistle for your car. Free exhaust. Very loud and sweet toned. Money back if not satisfied. Price \$4.50. Auto Improvements Company, Bristol, Rhode Island.

FORD "T" OWNERS—Complete Magneto Lighting Outfit including large silver-plated reflectors and Tungsten bulbs, \$3.50. John Wilson, Jr., Edgewood, R. I.

MODEL O, WHITE STEAMER for sale—All good tires, extra tubing, fully equipped, new Thermostat and Pyrometer. Owner has not time to use car. Address box 205, Kitzmiller, Md.

SECOND HAND CARTER CAR WANTED—Give full particulars including age of the car and price. Address Cash, care of the Automobile Dealer and Repairer, P. O. Box 654, New York City.

AUTOMOBILE CYLINDERS reground, new pistons and rings fitted. Garage air compressors. Cast Iron Brazing Co., Manchester, N. H.

RAISE FLAX at \$2.00 per bushel. One hundred and sixty acres medium, heavy, black soil, three miles from town, for sale. Every foot tillable. Would take good automobile on deal. H. W. Emanuel, Milnor, N. Dak.

FOR SALE OR TRADE—One Autocar, 2-passenger, new tires, fine shape. Will take a good Ford car or Overland for it. Also a Thomas 4-40, fine shape. Will trade for good light car, Ford or any good light car. D. L. Magee, Boonville, Ind.

FORD OWNERS! We have the best Cut-Out on the market. Something new. Price \$2.00. Auto Improvements Company, Bristol, Rhode Island.



The Livingston Radiator PROVED BY TEST

Radiators made or repaired for any type car.

Have a new radiator made for your car and increase its value 25 per cent.

Our corps of expert repairmen at your service. All charges based on time consumed. Results guaranteed.

Send in your old radiator and get estimate.

LIVINGSTON RADIATOR AND MFG. CO.
136 W. 52d St., New York City

SILVER PLATE the brass on your automobile and eliminate polishing, easily applied, costs less than polish, formula 25 cents, silver preferred. Box 21, Sabina, Ohio.

FORD OWNERS! Light your headlights for nothing by using electricity instead of gas. This outfit can be attached without disturbing the gas system. Complete outfit includes two large reflectors, Tungsten lamps, wire and switch. Satisfaction guaranteed or money back. Order to-day. Price \$5.00. H. C. Peckham, 17 Snow St., Providence, R. I.

FLANDERS OWNERS: We have ten brand new tops for Flanders car fine mohair complete with curtains value \$35.00, our price \$10.00 each. Puritan Machine Company, 55 10th St., Detroit, Mich.

WANTED—An experienced automobile body department manager for one of the best electric automobile companies in America. Only those with exceptional ability and experience need apply. A producer wanted. Confidential, care of Automobile Dealer and Repairer, Box 654, N. Y. City.

ATTENTION—Have a few manufacturers samples, gentlemen's black broadcloth fur lined overcoats, lined throughout with Australian mink, large genuine Persian lamb collars, size 36 to 48, value \$75, will sacrifice for \$35 each. Also several ladies handsome long fur coats, satin lined, worth \$90, while they last \$35; and few large size fur robes, plush lined, \$15 each. All guaranteed new. Examine before buying. Send express charges. Will send on approval. Write or call. E. Roberts, Room 9, 160 West 119th St., New York

FOR SALE—Five-passenger White Steamer 1909 Model O, in good condition, circumstances are such that I have no use for the car, any reasonable offer will not be refused. Address, I. N. Rush, Hopkinsville, Ky.

FOR SALE—1907 White Steamer fully equipped with full leather top; Prestolite tank; new tires. Perfect running order. Will sell for \$500. Charles D. Sherman, 212 Orchard St., New Haven, Conn.

FOR SALE—Well established automobile and motor boat repair business consisting of two lots, one 30x24, building, machinery, tools, stock of supplies, etc. Last season did \$7000.00 worth of business. \$2500.00 cash takes it. Address, E. W. Splittstoser, Pine City, Minn.

FORD OWNERS! Best mohair top covers. Dust proof and water proof. Perfect fitting. Satisfaction guaranteed. Order today and state model. Price \$5.50. H. C. Peckham, 17 Snow St., Providence, R. I.

A NO. 1 REPAIRMAN DESIRES CHANGE, 7 years experience, first-class references. E. F. Utz, 233 N. 11th St., Hamilton, O.

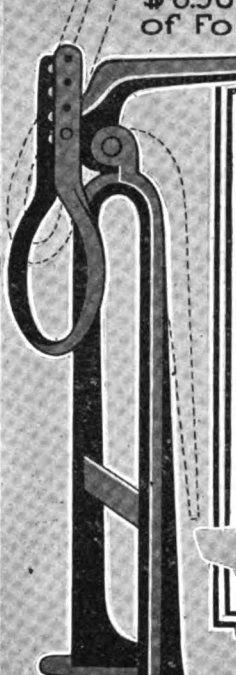
SCORED CYLINDERS repaired \$12. No enlargement of bore—no need for new pistons and rings. Send piston with cylinder. Absolutely reliable method. References, testimonials and full details on request. Waterbury Welding Company, Waterbury, Conn.

AUTOMOBILE MANUFACTURING CONCERNS, ETC., TAKE NOTICE. Latest novelty, Panama Canal map in colors, 27x42 inches. Special prices 1,000 lots, with your cuts, advertising, etc., in margins. Samples postpaid 25 cts. Fred B. Westwater, 1348 Douglas St., Los Angeles, Calif.

Aer-oid Puncture Proof Tires.—A new puncture proof tire filler has been placed on the market by the Aer-oid Sales Co., 1777 Broadway, New York City. The manufacturers claim that this is the most practical tire filler yet produced, owing to the fact that the whole tire filler and casing is put up for any make of automobile rim under proper pressure, for any weight of car, and shipped to the consumer in any part of the country ready to bolt on to the wheel without the bother of installation, or trouble in any form. The tire com-

Moore Tire-Saving Jacks

\$650 Per Set of Four Jacks



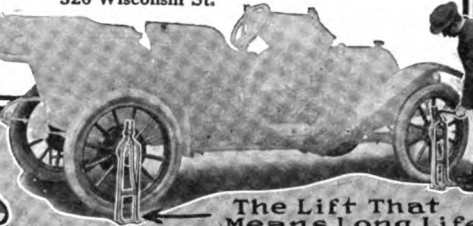
RUBBER tires are a mighty good thing for your automobile to run on but a mighty poor thing for your car to stand on. The weight of your machine does little damage to the tires when in motion. It does a lot of harm when steadily bearing down on them at one point while they're at rest.

Get a set of Moore Tire-Saving Jacks—and relieve your tires of every ounce of life-robbing weight-strain—in two minutes time. No fussing, or stooping or crawling under car. Simply slip padded loop on hub and press down lever. Boy can easily raise heaviest car. And the lift that frees the tires from needless weight raises them clear of the rubber-rotting oil and grease on your garage floor.

DEALERS:—Show them and you sell them! You can't go wrong in starting in with sample order of four or six sets. Write today.

Set of four Moore Jacks (adjustable to any car) costs \$6.50, and will save you from \$25.00 to \$150.00 every year. If your dealer cannot supply you, we'll send you a set, prepaid, on receipt of \$6.50.

J. C. Moore & Co., Racine, Wis.
326 Wisconsin St.



The Lift That Means Long Life

plete including the puncture proof filler costs no more than the ordinary tire casing for two air tubes, and the filled casings are sold under a 5000 mile guarantee so long as the Aer-oid cores are properly installed new, or transferred properly by this company or its authorized agents. Perfect methods of handling installation at the factory and selling the complete outfit puts Aer-oid, it is claimed, in a class by itself where the consumer or the agent is to be considered. Aer-oid is manufactured in cores or cylindrical in form and may be put in or taken out of the casing at will like an air tube. Attention is called to the attractive full page announcement in our advertising department this month, and interested readers are urged to correspond with the Aer-oid Sales Co., 1777 Broadway, New York City, and in doing so this magazine should be mentioned.

Removal.—The Atwater Kent Mfg. Works, are now established in their new factory, 4937 Stenton Avenue, Germantown, Philadelphia, Pa. The building is a one-story structure, containing 21,000 square feet and especially designed for the work of the concern.

Send for free sample of The Automobile Dealer and Repairer.
MOTOR VEHICLE PUBLISHING CO.,
71-73 Murray St., New York.



Automobile Owner
If you are tired paying the usual high list prices for Auto Supplies, write for our 35% catalog.
35% AUTOMOBILE SUPPLY CO.
97 Chambers St., New York.
1508 Michigan Ave., Chicago, Ill.
236 Peachtree St., Atlanta, Ga.



AGENTS
SEND FOR PROPOSITION
Hawthorne FOUR Cylinder Hand Air Pump
HAWTHORNE MFG. CO., Inc.
1 Spruce St., Bridgeport, Conn.

Firestone

SMOOTH TREAD Tires
or NON-SKID
REDUCE TIRE AND CAR UPKEEP

RUBBER PUTTY FOR Tires

The Greatest Invention of Its Class. A True Money Saver and a Protection to Life and Limb.
Sold at once for booklet giving further particulars and prices.
The Toledo Auto Devices Co.
709 Gardner Building, Toledo, Ohio.

The War of 1913

The Fierce Fight Raging Among 40-Horsepower Cars

72 Rivals in It

We are nearing the climax in the fiercest fight that Motordom has ever known.

72 makers of cars around 40 horsepower are contending in a fierce struggle for supremacy.

The chief interest centers around six of these cars. For six leaders, backed by millions of money, are each seeking to dominate this great middle field.

The Michigan "40" is one of these six. The ablest engineers have spent four years to fit it for this fight. And it comes this year to claim first place in all this Forty class.

How the War Began

The trend of the times is toward luxurious Forties.

Owners of small cars come to want more power, more comfort, more room, more appearance. Owners of oversize cars come to want more economy.

So the demand for Forties, in recent years, has become overwhelming.

To meet that demand, 72 makers have taken up Forties. Hundreds of the ablest engineers have centered their genius in them.

Today the finest cars ever built in America belong to the Forty class.

Prices Cut in Two

One result has been to bring out in these cars all the best improvements of the past few years.

Another has been to develop comfort and luxury, beyond anything dreamed of a few years ago.

Another result shows in splendid equipment. Each maker has sought to outrival the others. Some cars at twice the price are not equipped like the modern Forties.

But the greatest result is the

cutting of prices. Some makers' prices have been cut in two. Forties are selling, with splendid equipment, for what stripped Thirties used to cost.

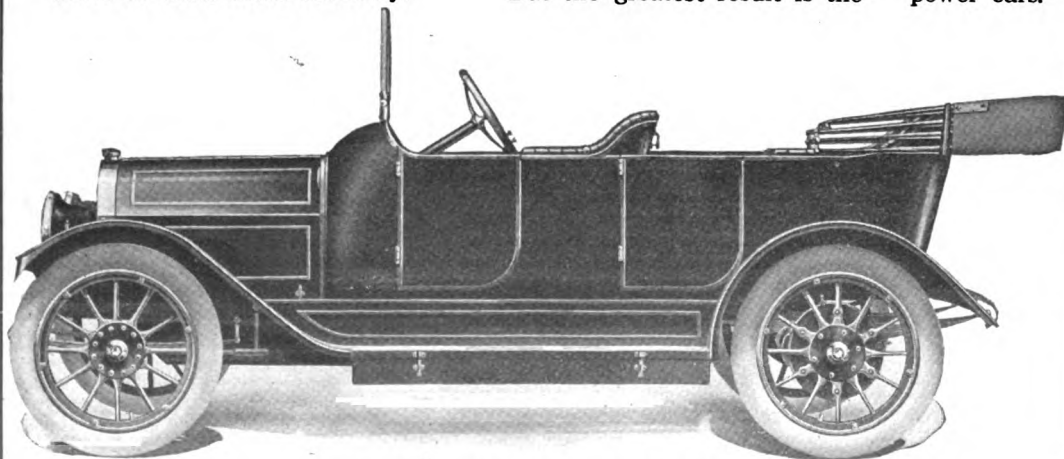
The car which gives the greatest value is bound to win this contest. And every maker knows it.

In quality, equipment, comfort and luxury there are limits beyond which none can go. These limits are reached in the Michigan "40."

Then comes the question of factory efficiency. Who can build such cars for the lowest price? Who dares accept the smallest profit?

Big Saving to Buyers

So this war of the Forties means enormous savings to men who watch out and compare. Cars in no other class match the Forties in value. All because there are 72 makers fiercely fighting for favor with 40-horsepower cars.



Michigan "40"

Four Speeds
Extra-Tired
Electric Lighted
Equipped With
Every Modern
Feature

\$1,585

Michigan "40"—Equipped—\$1,585

Please mention the Automobile Dealer and Repairer when writing to advertisers.

The Michigan "40"

**Electric Lighted—Four Forward Speeds
Extra-Tired—Price, \$1,585 Equipped**

Our Offer is This

We enter this fight this year with a value which no maker ever has matched.

You can easily prove this—in one hour's time. Just make fair comparisons.

We have spent four years in perfecting this car. Some of the ablest engineers have worked year after year on it.

We have made since the start over 300 improvements—71 in the past year.

We have sent out in four years about 5,000 cars, and watched every car's performance. Last year this car, in our test cities, outsold every rival.

The Michigan "40" today represents the last word in motor car engineering.

Cameron's Car

Our designer-in-chief is W. H. Cameron, for years the chief engineer of the Overland.

Our body designer is John A. Campbell, famous all the world over. He has been frequently chosen to design equipages for kings.

Every part and detail is in charge of an expert—the ablest man we could find for the purpose.

To these men we have given more than ample time to bring out the utmost of which they are capable.

We have equipped for them a model factory, with 600,000 square feet of room. And we have backed them with all the money and all the experience gained by 30 years of vehicle building.

The result is this wonderful machine, known as Cameron's Car—one of the finest examples in the world today of the modern motor car.

What It Includes

Mark the price of this car—\$1,585. Then note what that price includes.

Note the four forward speeds—a feature heretofore confined to the highest-priced cars.

Note the electric lights and dynamo. This feature as an extra on other cars usually costs \$125.

Note the oversize tires—35x4½. The usual tire equipment on Forties costs \$50 less.

Send for our catalog and make all the comparisons. Measure up the features, one by one, with all our rival cars. Judge for yourself if any Forty car on the market offers what the Michigan gives.

Then let our local dealer show the car. Take care, for your own sake, to get the utmost advantage out of this fight of the Forties.

MICHIGAN MOTOR CAR CO., Kalamazo, Mich.

Owned by the owners of the Michigan Buggy Company

Some of the Michigan Features

Four forward speeds, instead of the usual three speeds.

Tires 35x4½, instead of the usual 4-inch tires.

Electric lights with dynamo.

Electric horn.

Center control and left-side drive. Both front doors clear.

Motor 40 to 48 horsepower.

Extra effective brakes—16x2¼ inches.

Big, comfortable springs.

Adjustable steering post.

Adjustable pedals.

Firestone Demountable rims—extra rim.

14-inch cushions—deeper than any rival.

Rear seat 50 inches inside.

Hand-buffed leather of the finest grade, filled with the best curled hair.

Wheel base 118 inches.

Nickel mountings.

50 per cent average over-capacity, allowing big margins of safety.

Pressed steel, full-floating rear axle.

Axles sufficient for an 80-horsepower car.

Best mohair top, side curtains and envelope.

Windshield built in as a part of body.

12¼-inch electric headlights.

Side lights flush with dash.

Body finished with 22 coats.

Electric horn.

\$50 speedometer—4-inch dial.

Special foot rail and robe rail.

Complete tool equipment.

Tool chests under running boards. (100)

Self-Starter

There is such a difference of opinion about the relative merits of the various types of self-starters, that we have not adopted any one type as regular equipment.

We prefer to leave this selection to the buyer.

However, we equip with either the gas starter or a positively efficient electric starter, at a very moderate extra price.

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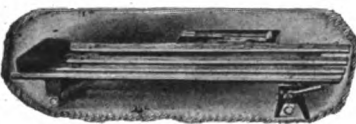
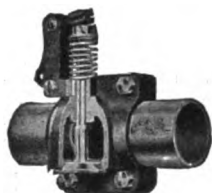
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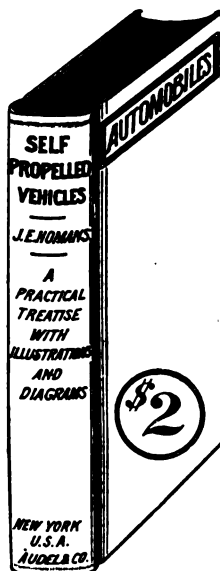
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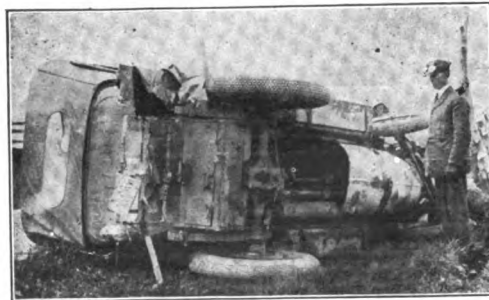
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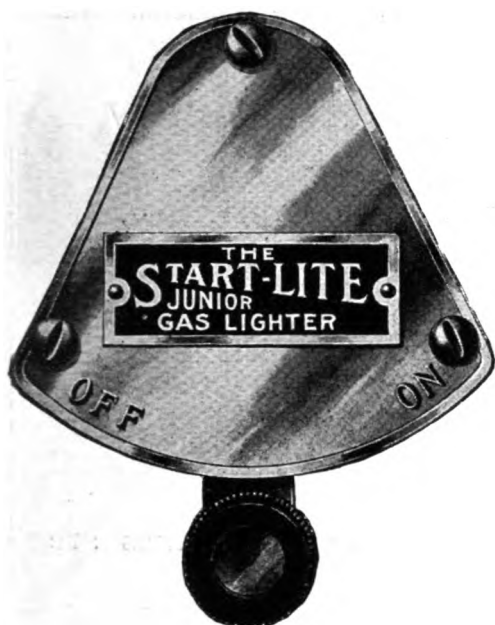
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7. The START-LITE Junior is proof against all climatic conditions.
8. The START-LITE Junior **will last longer than your car**. It is trouble-proof.
9. The START-LITE Junior **will pay for itself** in one season on gas saved.
10. The START-LITE Junior is a source of convenience and comfort. It **adds real pleasure** to motoring.
11. The START-LITE Junior cannot be tampered with by the small boy or the curious passer-by.
12. The START-LITE Junior is sold on a **positive "Money Back" Guarantee**.

DEALERS

We need not tell you what to do. You know START-LITE Quality is highest—You know START-LITE Guarantee means protection to you and your customers. If you are wise you will get busy. TO-DAY—NOW.

1502 P Michigan Ave.

THE
START-LITE
COMPANY

CHICAGO, ILL.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

**“A car which cannot be stopped quickly
is a menace to the public.”**

—*The Automobile.*

In other words, it *all* depends on the brakes. On the hills, in traffic, at the crossing, it isn't a question of speed, horse-power, or appearance, but the big thing is—

How quickly can you stop the car?

Brake efficiency depends on design, material, lining. The best brakes are those which will act instantly.



DUPLEX
EXTERNAL
BRAKES

Will stop the heaviest car with slight pressure. Not only that, but they will stop the car from *sliding backwards*. They possess large surface, correct design and the very best material.



TRADE MARK
Raybestos
REG. U.S. PAT. OFF.

The Peer Of All Brake Linings

A solid, substantial fabric, presenting a wall of strength. Outwears any other lining, because it is made of genuine long fibre asbestos, specially treated, woven with great care. The sizing and rolling is systematically accomplished so that every inch of the fabric will give highly efficient service and outlast any other lining on the market. The name “RAYBESTOS” is stamped in every foot of the fabric.

Demand and insist upon getting RAYBESTOS—the Quality lining, efficient, economical and almost wear proof.

THE ROYAL EQUIPMENT COMPANY

450 Housatonic Avenue

Bridgeport, Connecticut

We also make Raymond Brakes and Gyrex, the Mixer



PROTECT YOUR TIRES

WITH

DAVIS STEEL TIRE "ARMOR"

AN IDEAL TIRE PROTECTOR FOR
AUTUMN AND WINTER MOTORING

Easily adjusted, ENTIRELY covering the tire, in its smooth, snug, flexible, powerful grasp—ALWAYS sustaining it, ALWAYS taking the strain from it, and in mud, snow or even ice it CANNOT skid.

DOUBLE THE LIFE OF YOUR TIRES

We give an IRON-CLAD INDEMNITY BOND guaranteeing TO AT LEAST DOUBLE the guaranteed mileage of any reputable tire manufacturer. This BOND also covers our 2-year service guarantee.

DAVIS STEEL TIRE "ARMOR" is strong, easy-running, long-wearing, most economical tire protector on the market.

Although made of steel, it will run as lightly and will not detract one particle from the resiliency of your tire, and it offers an **absolute guarantee** against

Blowouts, Skidding, Punctures, Rim-cutting, Stone-bruise or Rut-wearing.

DAVIS STEEL TIRE "ARMOR" is easily attached in five minutes and has no leather to come "unglued," no springs to stretch or break, no "inner shoes" to pinch the tubes, no resiliency destroying "fillers." It always holds so firmly to the tire that its support is **absolute**. The tire is always cool.

If you have not as yet seen this DAVIS "ARMOR" TIRE PROTECTOR in **actual service** on a car in your community you had best

MAIL THIS COUPON TODAY 

for it is worth a whole lot of money to you provided only that you **act quickly**.

Our 1912, 16-page, 3-color Art Booklet will be mailed free for the asking.

AGENTS WANTED EVERYWHERE.

ORDER TODAY

One of our world-famous
**DAVIS MOTOR
LAP-ROBES**

Either the "standard" pattern for the "passengers" or the "overpants" pattern (state inseam length) for the "man at the wheel." Price of either only \$10.00, sent express paid upon receipt of price, or sent free for examination on request.

These are without doubt the most Common Sense and most used Motor Lap-Robes ever devised.

**ELIMINATE
FURTHER
TIRE COST
FOR AT LEAST
TWO YEARS.**

Davis Robe & Armor Co.
10 State Street
CHICAGO, ILL., U. S. A.

Coupon
D. R. & A.
CO.

Send at once your liberal "first users" proposition. I have not seen the IMPROVED DAVIS ARMOR here.

Name.....

Address.....

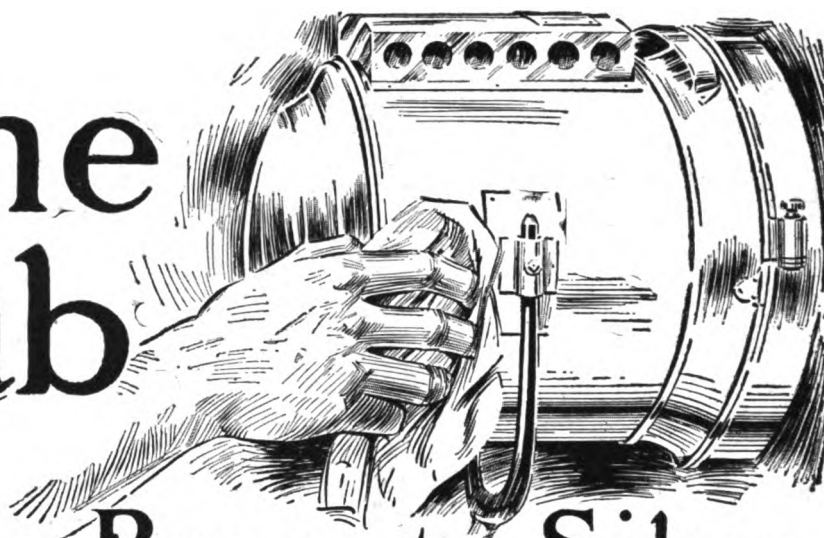
Size of my tires.....

My dealer's name is.....

A. D. & R., Sept., 1912.

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One Rub



Turns Brass to Silver

Talk about your nickel-plated lamps! In a few minutes you can *silver* plate every piece of brass and copper on your car. It is *actually easier than polishing* the brass. It does away with all the polishing hereafter. All you need is a piece of cheesecloth and a bottle of

Trade **Silver Quick** Mark

*One Rub
Turns Brass to Silver*

\$1.00 bottle will silver plate your whole car

Right now stick a dollar bill and your card in an envelope and mail to us for a bottle of SILVER QUICK. Silver plate every piece of bothersome brass on your car. Get away from that cheap, brassy look. Make your car as up-to-date as any 1913 model.

You can do it in a few minutes with SILVER QUICK, and say good-bye to polishing forever. SILVER QUICK is not mercury

or quicksilver; it gives a genuine silver plate. When long exposure has made the first coat dull, just use SILVER QUICK again. It's easier than polishing. \$1.00 bottle will silver plate all brass work on any car. Send \$1.00 now. You run no risk. We absolutely guarantee SILVER QUICK to *be and do* everything we claim for it. We will give you your money back if you ever ask for it.

Atlas Auto Supply Company, 77 East Adams St., Chicago

Manufacturers of Tire-Doh, sold for three years on money-back guarantee—our policy

Clip the Coupon Now

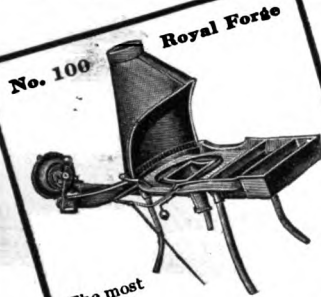
You Can't afford to Forget This

Dealers Wanted Everywhere.

Write your jobber or to us.

A Reminder to ask an Auto Supply Dealer for **SILVER QUICK** or to send One Dollar to Atlas Auto Supply Co., 77 East Adams St., Chicago, to get a bottle, express prepaid.

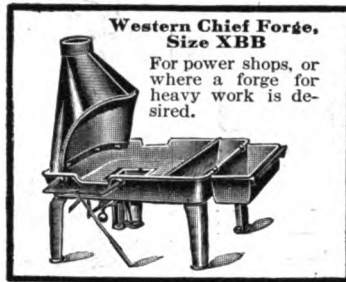
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No. 100

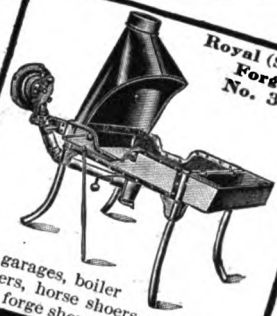
Royal Forge

The most popular forge of to-day.



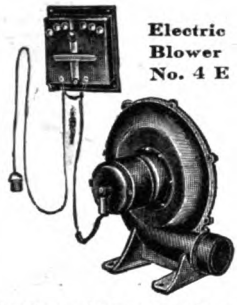
Western Chief Forge, Size XBB

For power shops, or where a forge for heavy work is desired.



Royal (Steel) Forge No. 37

For garages, boiler makers, horse shoers or any first-class forge shop.



Electric Blower No. 4 E

One fire variable speed blower.



Royal H. Blower

Fire Pot 8x 9 1/2 x 4 in. inside.

The successful blower.

Spur gears used only. Ask the man who owns one.

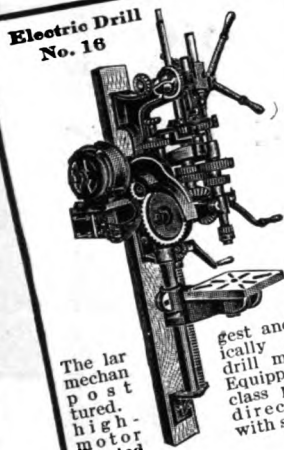
When the Name CANEDY-OTTO

is found on a Forge Blower, Drill or any other Blacksmith Tool that is all the guarantee necessary

We Warrant All Articles of Our Manufacture

SOLD BY JOBBERS AND SUPPLY DEALERS EVERYWHERE

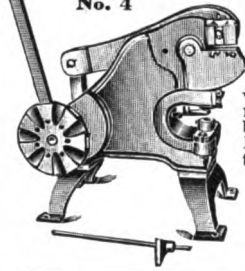
CANEDY-OTTO MFG.CO.
CHICAGO HEIGHTS, ILL. U.S.A.



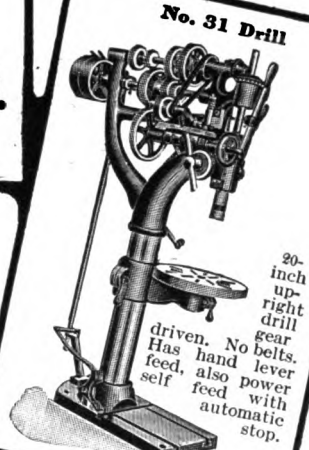
Electric Drill No. 16

The largest and most perfect mechanically manufactured drill. Equipped with class powerful directly connected with spur gear drive.

Combination Punch and Shear No. 4

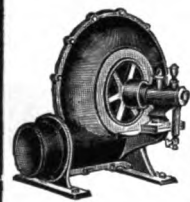


It can be operated toward the front or back. Depth of throat 6 inches.



No. 31 Drill

20-inch up-right drill gear driven. No belts. Has hand lever self feed with automatic stop.



Power Blower

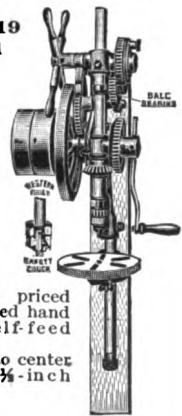
Made in 5 sizes. Adapted to forge fires and light Cupola work. Built for service.



No. 1 1/2 Western Chief Tire and Axle Shrinker

The easiest operated shrinker in the world.

No. 19 Drill



A low priced combined hand and self-feed drill. Drills to center of 1 1/2-inch circle.

COUPON

CANEDY-OTTO MFG. CO.,
Chicago Heights, Ill.

Gentlemen:

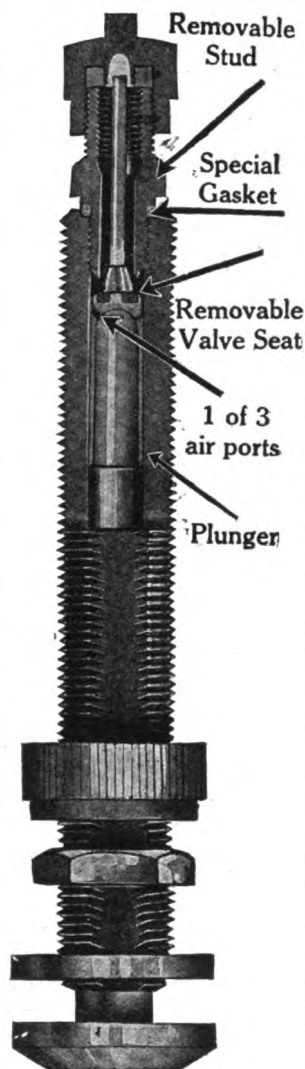
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Name _____

P. O. Address _____

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Give name of your jobber or supply dealer here _____



BURKE TIRE VALVES

cut off two-thirds the time
and labor of tire pumping

LABOR SAVING. When you inflate a 34x4 tire having Burke Valves you do away with *two tons* extra work now wasted on old-style spring closed valves. All because Burke Valves have *no spring resistance* whatever, to the charging pressure.

TIME SAVING. Burke Valves have three times the capacity to transmit air from pump to inner tube. They inflate or deflate in one-third the time.

ECONOMICAL. The stud or end section (the part most liable to injury) can be removed and a new one substituted, saving time and the expense of a new valve.

STANDARD and UNIVERSAL. Burke Valves are standard as to size and their interior parts fit every other Burke Valve, no matter what size.

DEMAND BURKE VALVES. If your dealer does not carry them, write us for booklet and we will see that you are supplied.

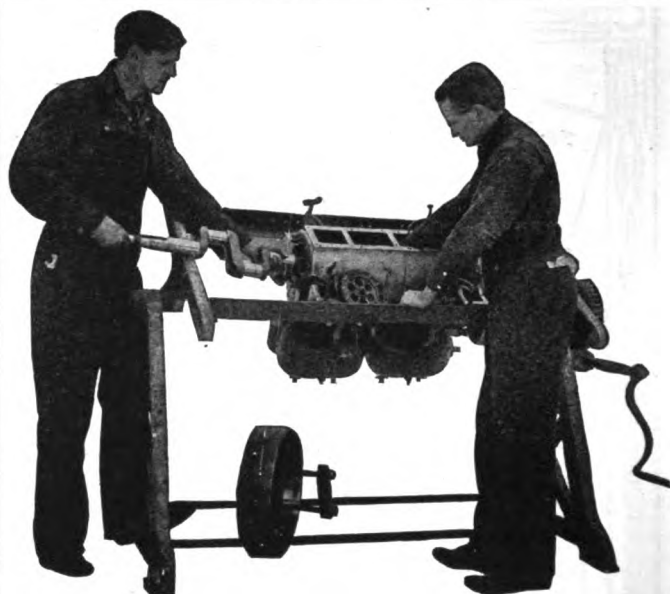
SPECIAL OFFER

Mail one dollar and we will send 1 set of four No. 338 Burke Valves for 3½ to 6 in. tubes, including 2 extra studs and plungers.

THE BURKE VALVE CO.

233 The Arcade

CLEVELAND, OHIO



HACO MOTOR STAND

To be used in repair shops and factories for disassembling, testing and painting motors.

Adjustable to any motor.

Self-locking in any position.

Motor may be easily turned to any desired angle by one man.

Provides easy access to connecting rods, cam shaft, etc.

Fly-wheel or motor may be belted to any convenient pulley for working in bearings, etc.

Write at once for further particulars and price.

HATHORN AUTO CO., Manufacturers,
Dept. B, MASON CITY, IOWA.



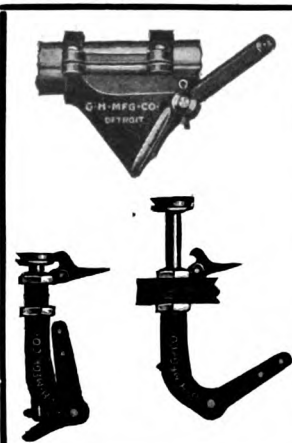
Chemical Accessories
For the Motor Car

Dealers: Send for FREE BOOK—

*You Should Know How to Enamel
Brass Fixtures on Automobiles.*

Catalog A describes our full line of Hard Rubber Air Drying Enamels for Brass Fixtures, Cylinders, Tops and Seat Cushions. Mohair Waterproofing, Mohair Top Cleaner and Valve Grinding Compound.

NieNie Manufacturing Co.,
Minneapolis, Minn. U. S. A.



GRAY CUT-OUT

Cut Notch in Pipe and Clamp over it.

There's Nothing Better.

Price, \$1.50 to \$2.50.

GRAY LOCK PEDAL

Simple and Efficient.

Price, \$1.00. Without Lock, 85c.

ASK FOR CATALOG No. 41

It describes our complete line of Gray Mufflers, Autochimes, Autalarms, Filters, Pedals, Valves, Motor Boat Fittings, etc.

GRAY-HAWLEY MFG. CO.

937 JEFFERSON AVE. DETROIT, MICH.

Send for free sample of The Automobile
Dealer and Repairer.

MOTOR VEHICLE PUBLISHING CO.,

71-73 Murray St., New York.

Just 2

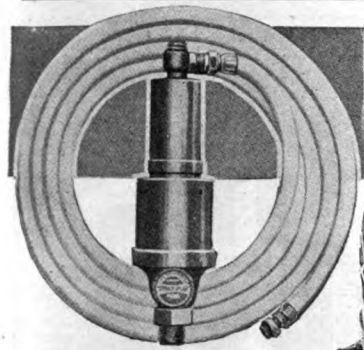
Unit parts to the Friction Transmission, which is making the

Cartercar

so popular everywhere. That's why it is so reliable. And you have an unlimited number of speeds—one lever control—power to climb 50% grades, run through bad mud and sand—and absolute silence. Write for catalog.

Cartercar Company
Pontiac, Michigan
Branches: New York, Chicago, Detroit, Kansas City

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KEEP COOL!

Don't spoil your motoring pleasure pumping tires by hand.

Save time, temper, and energy by letting your motor pump them for you with a

SPARK PLUG PUMP

Simply substitute it for any spark plug, let your motor run, and in from 3 to 4 minutes it will inflate the largest tire with air taken pure and cool, direct from the atmosphere. No deteriorating gases are drawn from the cylinder.

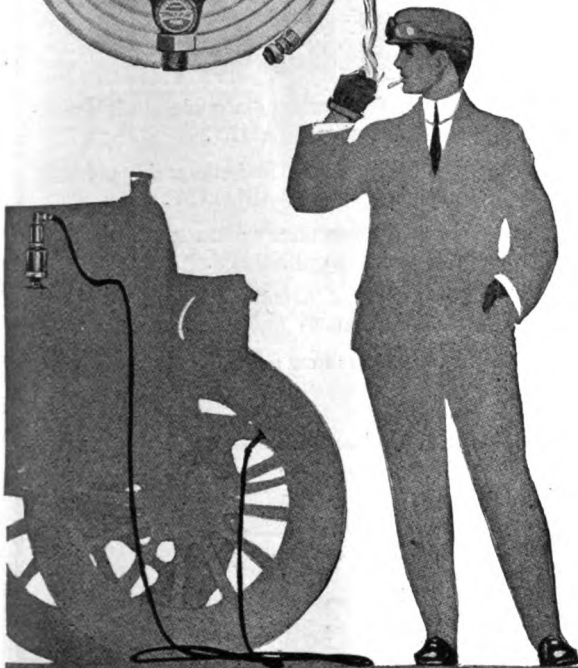
Simple, isn't it? Doesn't it beat wrestling with a hand pump on hot and dusty days?

The SPARK PLUG PUMP complete weighs but 2½ pounds. It is so compact that you can take it with you anywhere in the tool box. It is made with metal rings like your motor—and will last as long. Because it comprises no complications it offers every motorist a lifetime of trouble-proof pump service. An occasional oiling is the only attention it ever demands.

Adaptable to all sizes of cars, from the smallest FORD to the largest LOZIER.

COMPLETE WITH 12 FEET OF HOSE AND CONNECTIONS **Price \$10.00**

MAYO MANUFACTURING CO., 59 E. Eighteenth St., Chicago



The Atwater Kent Ignition System

ANY CAR equipped with a self-starter requires an ignition system capable of producing a hot starting spark with the engine at a standstill.

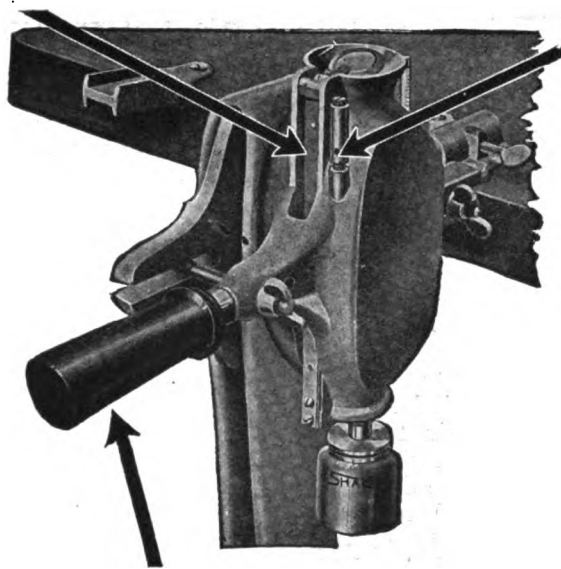
Instead of a thin stream of weak sparks, the starting button of the Atwater Kent System produces a single heavy flame-like spark from three to five times hotter than the normal running spark. It will ignite any mixture that will burn.

This is but one of many excellent features of an ignition system that combines all of the advantages of both magneto and battery ignition—a simple device with but three moving parts, one contact, one adjustment—one non-vibrating coil—a system ideal in its efficiency, simplicity and reliability.

Write today for illustrated booklet "G"
full of interesting ignition information

Atwater Kent Mfg. Works,
Sixth and Market Streets, Philadelphia, Pa.





The Only Safe Steam Vulcanizer

Not because of the steam it contains, but because the temperature of the steam is held at the correct vulcanizing point *automatically*. This is essential to perfect vulcanization and makes the operation of the Shaler so simple that you or your chauffeur can make perfect repairs every time.

Exclusive **SHALER** Features

1. Thermostatic control that keeps the temperature of the steam exactly at the vulcanizing point without watching or regulating.
2. Safety valve set to relieve the pressure far below the danger point and prevent possibility of explosion.
3. Handle permits heating vulcanizer while preparing repairs and then moving from one repair to another while hot.

Do you realize that a vulcanizer will enable you to get double or treble service from your casings? That sealing cuts and sand-pockets prevents blowouts and eliminates the most disagreeable feature of motoring? With the Shaler you repair casings while on the wheel, fully inflated. No time lost, because the Shaler does not need to be watched.

Tubes are repaired on an asbestos inlaid metal shelf as shown in the illustration above.

We also make a complete line of vulcanizers especially adapted to public garage use.

Valuable Booklet FREE.

Fill out the coupon, mail it to us, and we will send postpaid a copy of the famous tire book, "Care and Repair of Tires."

Every motorist needs it because it's full of pointers that will help him get more mileage from his tires.

Send me a free copy of
"Care and Repair of Tires."

Name.....

Address.....

**C. A.
Shaler Co.**

808 Fourth St.,
WAUPUN, WIS., U. S. A.

QUALITY LUBRICANTS **HARRIS** TRADE MARK REG. U.S. PAT. OFF. **OILS**

Only the finest grade of Pennsylvania crude stock is used in HARRIS OILS—which means QUALITY.

Over a quarter of a century experience in the making of high grade lubricants—is bound to produce QUALITY.

The greatest care in manufacture, exhaustive inspections and attention to detail—insures QUALITY.

Injurious soot-deposit forming ingredients eliminated to the greatest degree—protects QUALITY.

And the highest indorsements from manufacturers, dealers, and owners who have used HARRIS OILS—proves QUALITY.

Get QUALITY lubricants for
your car—HARRIS OILS

A. W. Harris Oil Company

326 S. Water St.,
PROVIDENCE, R. I.

143 No. Wabash Ave.,
CHICAGO, ILL.



THE WORLD BEATERS



PRICE, \$2.00

No. 3 Edelmenn Tire Gauge

➔ Leads Them All ➔

Can be used as a tire tester or pump gauge. Slips over tire valve. Registers pressure in tire. If not sufficient, connect pump and inflate until proper pressure is attained.

GUARANTEED. RELIABLE.

TAKE NO SUBSTITUTES

The Economy Tire Gauge

➔ A Close Second ➔

No tire suicide when you use this tester. Indicator stays up so that you can read pressure after gauge is taken off tire.

Put up in neat leather case. Fits vest pocket.
ALWAYS ACCURATE.

At all dealers or from us by insured mail upon receipt of price.

E. EDELMANN & CO.
229-231 W. Illinois St., CHICAGO, ILL.



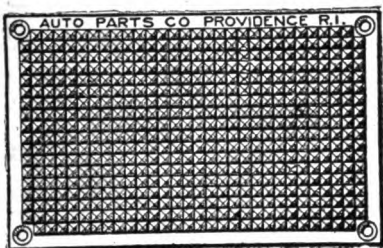
PRICE
\$1.00

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HEEL REST

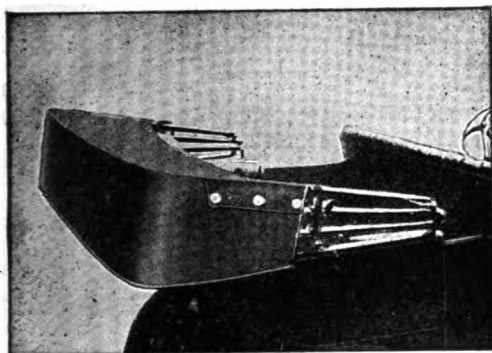
If there is one thing above another that is an eyesore to the man who cares about the appearance of his car it is that unsightly worn spot just back of the pedals in the rubber mat, and as the new mats cost \$2.50 and will not wear a month, we offer the APCO Heel Rest, which is made from cast aluminum, five by eight inches, and can be fastened in place in a few minutes. This plate has had a remarkable sale and it will not show any signs of wear after a year's use. An ornament to the highest priced car and a necessity to all.



PRICE, with Screws, \$1.00



SLIP COVER For Model "T" Fords



Do you realize that 20 per cent. of the power generated by your engine is required to push your top along when it is up? Do you also realize that nothing will ruin a top quicker than running your car with the top down without a cover. Last season we marketed a slip cover for the 1911 Touring Car, and it met with such approval that for 1912 we will make and carry in stock the same cover for the 1911 and 1912 Touring Car, Torpedo and Runabout.

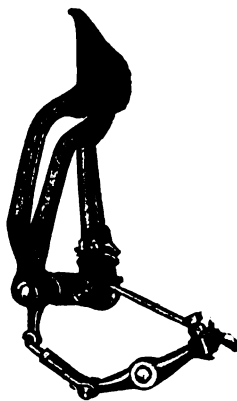
The covers are made from the finest silk mohair, put together in best possible manner, and are guaranteed to be a perfect fit. Do not confuse this cover with those advertised for \$5, as it is not made from oilcloth, but genuine rubberized silk mohair, custom made, and is a decided improvement to the car. Sample of material on request.

PRICE, Complete with Fastenings, \$7.50



AUTOMATIC CLUTCH RELEASE

A simple device that automatically releases the clutch on the Model "T" Ford when the foot brake is applied. Pressure on the brake pedal releases the clutch before the brake is applied, and if you wish to coast you simply push the brake pedal forward, which releases the clutch, and pushing the brake pedal farther forward applies the brake and brings the car to a standstill without the use of the emergency brake or the clutch pedal. This device will be found a great help to the amateur, as with it it is impossible to apply the brake without first throwing out the clutch, and in reversing the foot is always on the brake pedal to stop the car instantly without stalling the engine. Applying the brake without first throwing out the clutch wears the brake out quickly and puts a strain on the clutch that will cause it to slip after a few weeks' use. Our release can be put on your car in ten minutes with a screwdriver and is guaranteed to outlast the car. Put one on your car, and if it is not entirely satisfactory after two weeks' trial you may return it and we will refund your money. Furnished complete with full directions.



PRICE \$2.00 EACH. Sent prepaid on receipt of price.

"25 FORD SPECIALTIES." FREE CATALOG.

AUTO PARTS CO.

Providence, R. I.

THE

"ALL-IN-ONE" SPARK PLUG

POWERFUL—SOOTLESS—DURABLE



The "ALL-IN-ONE" SPARK PLUG is a combination plug and priming cup. To start your motor, you simply pour a few drops of gasoline into the priming cup and crank your engine. Sootless, reliable, durable, the "ALL-IN-ONE" SPARK PLUG cannot be surpassed at any price.

Invest \$1.50 now and insure yourself against spark plug troubles in the future.

FRONTIER SPECIALTY COMPANY

732 MAIN STREET,

BUFFALO, N. Y.

HORSEY



NO-CEMENT

INNER TUBE PATCH

Quick Repair for Punctures

right on the spot without musing your fingers with cement or acid patches. No repair kit needed.

Done in just two minutes with a little gasoline and the original and genuine "HORSEY" No-Cement Patch.

Lasts as long as the tube. The greater the heat, the tighter it sticks. A wonderful time and trouble saver. Never deteriorates with age.

The *only* No-Cement Patch that is *self-vulcanizing* and that will stand a *vulcanizing* test.

Always ready for instant use. Every car should carry them. Get yours now and be ready.

At your Dealer's, or send us \$1.00 and we will mail you post-paid a flat tin box containing 12 assorted patches, sandpaper and cloth.

PROOF

To prove to you the *Heat* and *vulcanizing* statement, we have contracted for a limited quantity of Gasoline Vulcanizers for you to make your own test.

SPECIAL PROPOSITION.

Send us \$2.00 and we will express to you the following:

- 1 Large Box (12 assorted) HORSEY No-Cement Patches, - - - - - Price, \$1.00
- 1 Adamson (original) Gasoline Vulcanizer. " 2.50

Quantity of vulcanizers is limited, order at once.

Manufactured by

The Horsey Manufacturing Company

5606 Euclid Avenue

CLEVELAND, OHIO



GUM-SURFACE YOUR LEAKING TOP.

Rub-R-Tite Top Waterproofing

Will stop them all from leaking and make Mohair Pantasote or other tops like elastic leather. Almost unbelievable results can be accomplished by making old tops practically like new ones, at a small expense and little labor.



RUB-ON AUTO TOP LINING DYE

Will dye any spotted or faded old top lining a perfectly even black color at one application with a sponge, without removing the top. Is water-proof and cannot wash out or fade more than new cloth would. The outside of faded mohair can also be dyed black.



RUB-ON ELASTIC VARNISH

Restores faded hoods or fenders to their original new color and lustre, to match the body finish exactly. Any one can apply it smoothly, it dries out over night and the car can be used next day. This new process varnish will last for months anywhere.



COL-R-OL LEATHER DYE RENEWS

Old cushions or pantasote tops. Made in the five standard colors.

A POSTAL NOW WILL BRING YOU a detail description and prices of all four articles, and samples of their work.

Sold by all the Leading Dealers.

Address RUB-ON VARNISH CO.
360 Elm St., Buffalo, N. Y.



Have You Tried Them?

Four corps of experts working in four of the best equipped tire plants in the world are operating as a unit to produce

UNITED STATES TIRES

Nothing of the kind has ever before been attempted in automobile tire manufacturing.

United States Tire Co., New York

PITNER PUMP

The only tire pump that's guaranteed for 5 years' service. Write for free book that tells why and explains all pumps.

PITNER PUMP CO.

1214 S. Michigan Ave. CHICAGO, ILL

Swinehart TIRES

Great American TIRES

DEALERS—You are part of our selling system.
Great American Rubber Co.
Conshohocken, Pennsylvania

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We Prescribe

ENDURA SHEET PACKING

if you have any packing to be done where you wish to feel certain that the job is done, when the joint is closed.

It is especially adapted for use where extremely thin packing is required, as the tensile strength is remarkable. Moreover, it does not stick to the joint, but leaves it clean when taken out.

Trial samples will convince you of its superiority.

ENDURA MANUFACTURING CO.
Philadelphia.

\$86 BUYS THE BEST SELF-MEASURING GASOLINE STORAGE SYSTEM.

THE DIRECT FACTORY PRICE puts into YOUR OWN POCKET the usual high sales commissions and expenses.

THE MILWAUKEE is in extensive use among the foremost Garages, Factories, Railroads, etc., in various parts of the country, and carries a strong guarantee of *Satisfaction*.

You need this approved system for safety, saving and convenience.



Write for Catalog today.

MILWAUKEE TANK WORKS,
Milwaukee, Wis.

Complete Equipments for Garages, Factories, Railroads, and all Oil Users and Dealers.



SCAIFE

Gasoline Storage Outfits

contain no complicated parts to get out of order.

A Welded Tank is the ideal construction for holding gasoline.

Wm. B. Scaife & Sons Co.
Founded 1802.
PITTSBURGH, PA.

CLEAN and POLISH YOUR CAR WITHOUT THE USE OF WATER.

By Using
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AUTO CLEANER and POLISH



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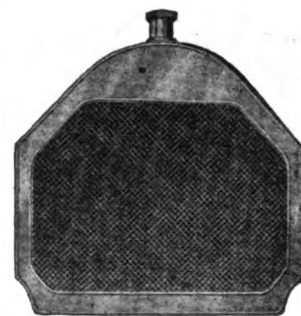
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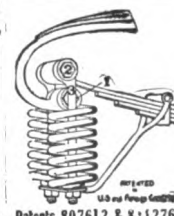
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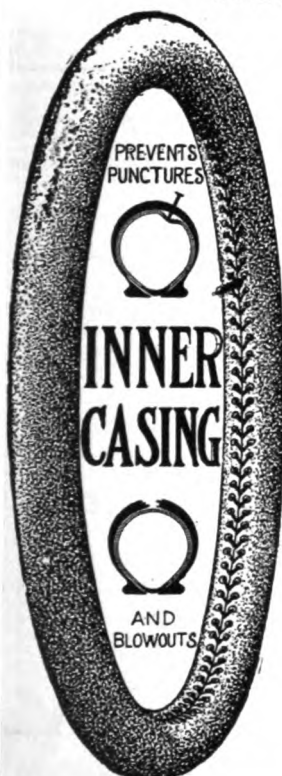


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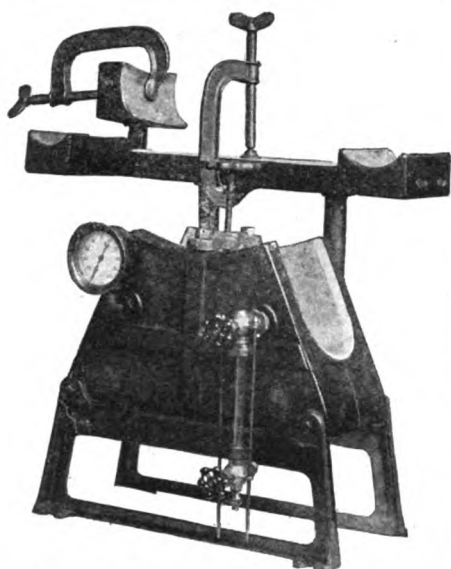
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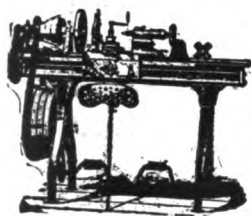


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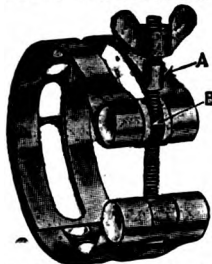
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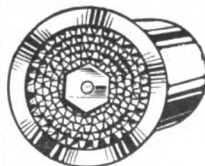
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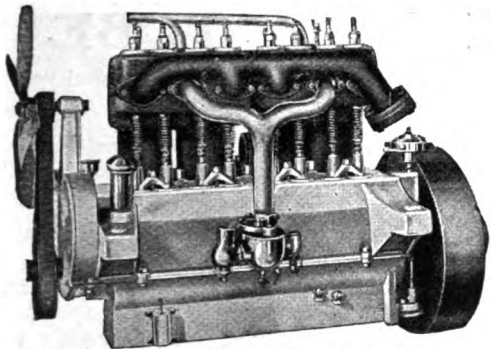
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It is one of many like it

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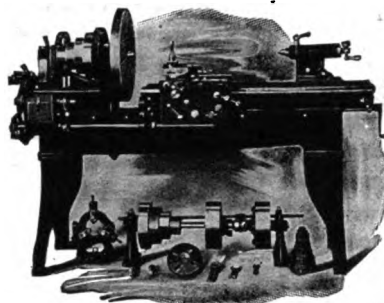
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Four Cylinder, Model B, for any special or standard make car.

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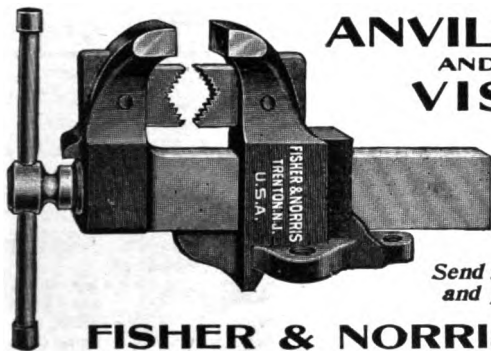
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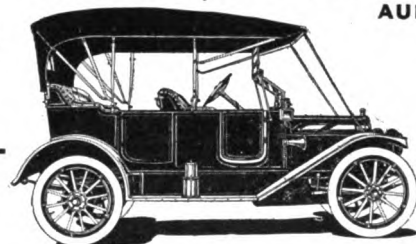
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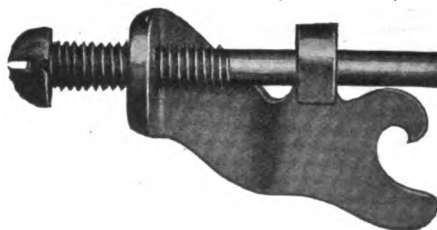
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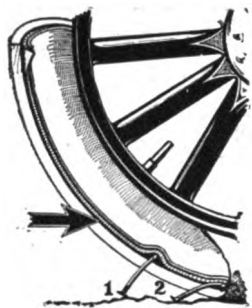
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Waban Webbing "BULLET PROOF"

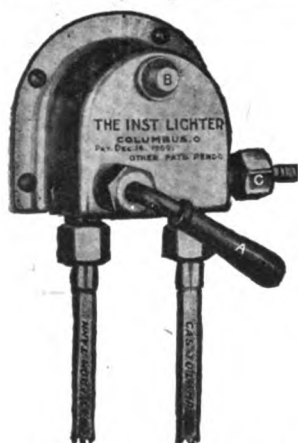
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Write for catalog and prices. We can save you money.
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DEALERS—GET OUR SPECIAL OFFER on this money-making guaranteed

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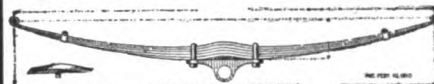
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What your business needs is more gasoline.

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Don't forget that the typewriter has made possible the enormous business development of this country, and that the plan we here advise is being carried out successfully by every live concern in the country.

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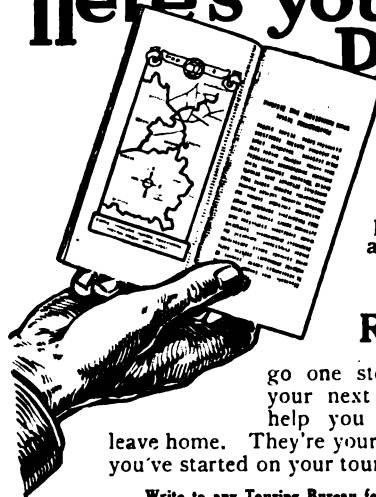
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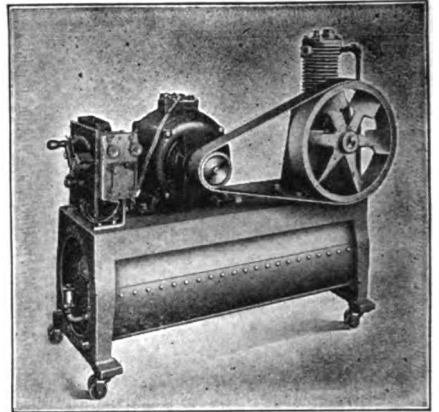
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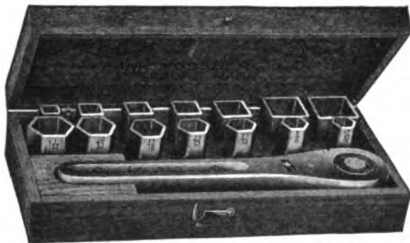
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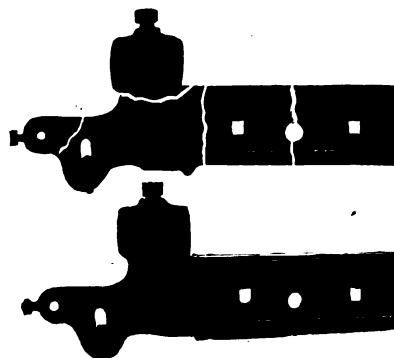
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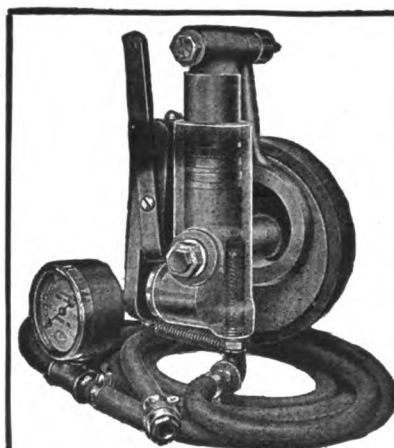
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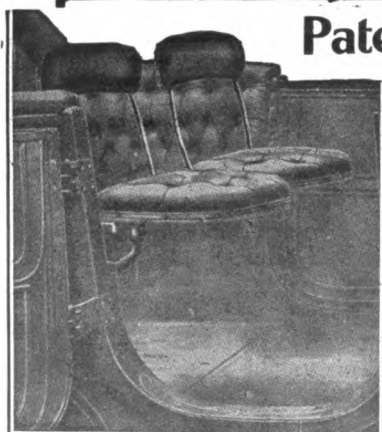
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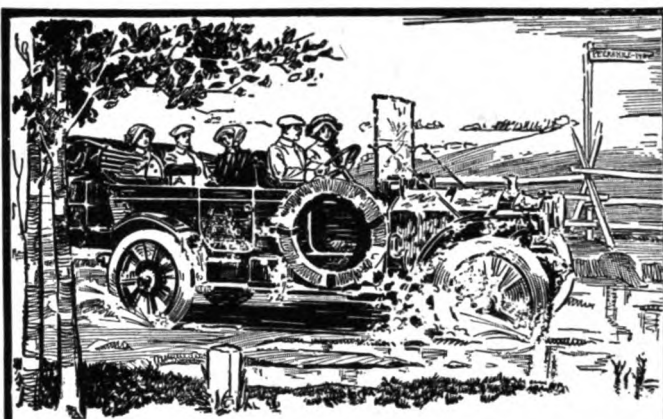
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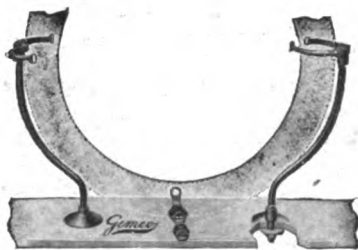
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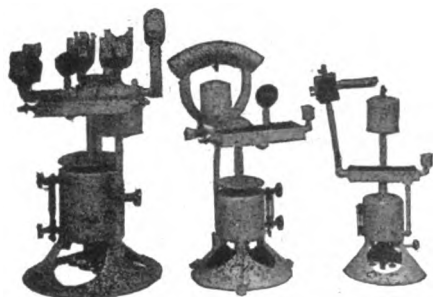
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Repairs Tires—both casings and Inner tubes or anything made of rubber WITHOUT VULCANIZING, and at one-tenth the cost.

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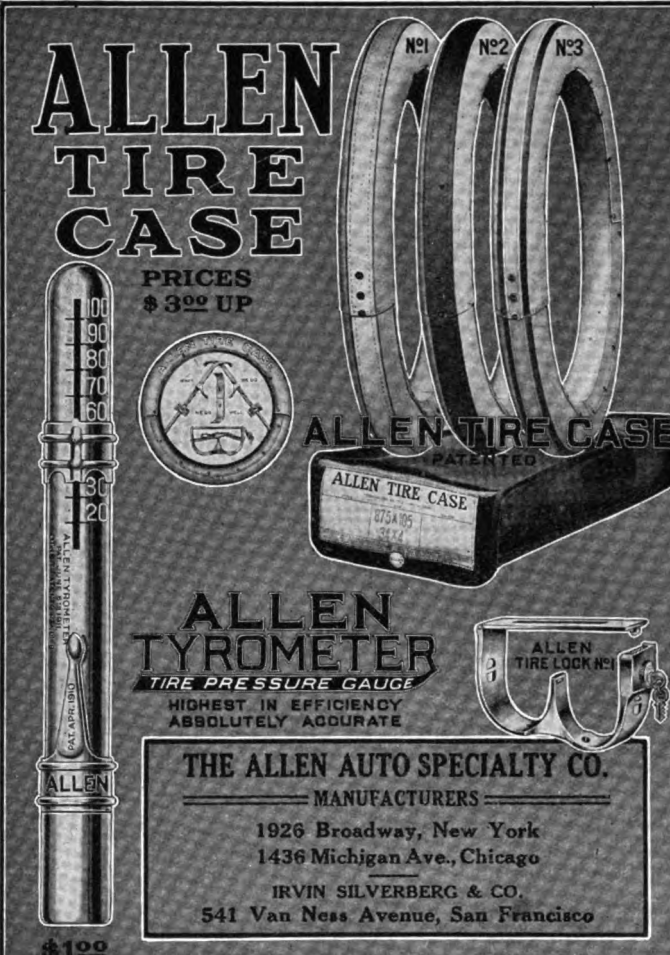
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Make no contract for the coming year until you have given our repair stocks and accessories a thorough test. Properly applied, our goods will stand up under any test to which you may subject them.

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ABSOLUTELY ACCURATE

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Guaranteed Satisfactory or Money Refunded
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ADAMSON MANUFACTURING CO.
East Palestine, Ohio
Patented April 2, 1912

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State.....

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Prest-O-Lite

Light your gas lamps
from the seat

Convert your oil
lamps into
gas lamps

Unsurpassed convenience without sacrificing known reliability and economy.

By equipping your car with the Prest-O-Lite you can light, dim or extinguish your headlights (or all your lights, if you wish) without leaving the seat.

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The gas tank valve is left open. Gas is turned on and off by a small valve on the dash. To light lamps, simply turn dash valve and push igniter button—flame is kept at proper height automatically. (This automatic reducing valve may be had without the Prest-O-Lite if desired).

Inexpensive—Efficient

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Owing to the perfect control the Prest-O-Lite gives you, it helps to cut down your lighting bills.

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MONARCH MAGNETO PLUG

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ATTENTION!

A NEW EXTRAORDINARY OFFER Get NEW PLUGS FOR OLD

Send us your old worn-out plugs of any make, and for each of these old plugs we will make you an allowance of 50 cents on the purchase of a NEW Monarch Magneto Plug. Of course, this is an advertising plan to introduce our plugs to new users. At this rate you get these plugs at half price.

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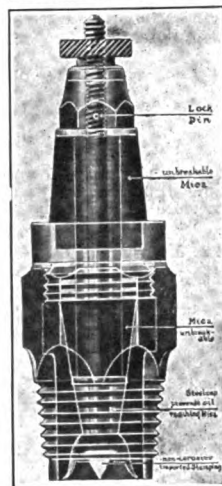
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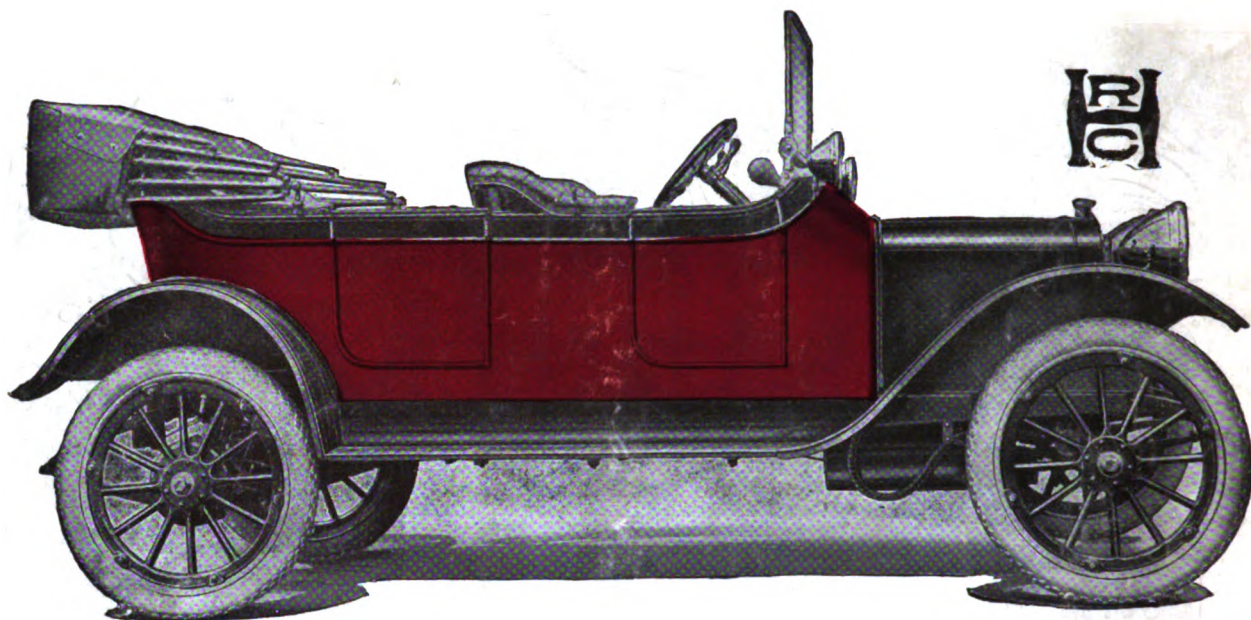
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Address.....

Size of plugs wanted





R-C-H

"Twenty-Five"

\$900

f. o. b. DETROIT

The Car

Wheelbase—110 inches.

Motor—Long-stroke; 4 cylinders cast en bloc, 3¼-inch bore, 5-inch stroke. Two-bearing crank shaft. Timing gears and valves enclosed. Three-point suspension.

Steering—Left side. Irreversible worm gear, 16-inch steering wheel. Throttle control on steering column.

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Axles—Front, I-beam, drop-forged; rear, semi-floating type.

Transmission—3 speeds forward and reverse; sliding gear, selective type.

Construction—Drop-forgings wherever practicable; chrome nickel steel used throughout all shafts and gears in the transmission and rear axle; high carbon manganese steel in all parts requiring special stiffness.

Body—Full 5-passenger English type; extra wide seats.

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Non-skid tires—32x3½.

12-inch Bullet electric head lights with double parabolic lens.

6-inch Bullet electric side lights with parabolic lens.

Bosch Magneto.

Warner Auto-Meter.

Demountable rims.

Extra rim and holders.

Tally-ho horn.

Jiffy curtains—up or down instantaneously.

Top and top cover.

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Robe Rail.

"Opportunity"

"Opportunity knocks once at every man's door" is an old and threadbare saying. Whether or not *opportunity* has in the past knocked at your door, whether or not it will in the future, is of no interest at this particular moment.

The most important point is that opportunity is knocking at your door *now*.

Here is the proof.

The R-C-H for 1913 is acknowledged everywhere to be the greatest selling proposition ever offered to automobile dealers.

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Some of them are taking summer vacations.

Others have closed their plants for inventory and repairs.

Others are between seasons.

One or two have orders up to their capacity and cannot accept additional orders at this time.

The R-C-H plant, however, is working *night and day*.

We have been delivering, since the appearance of the 1913 models, *better than 50 cars a day*.

You can get the cars. Many of your competitors *cannot*.

The public is buying cars *now*.

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Then, too, remember that we are backing the whole proposition with a National Advertising Campaign, the efficiency and extent of which have never been exceeded in this industry.

The opportunity to "make a killing" with an R-C-H now presents itself to you.

Now is the time. *Now* is the opportunity.

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Automobile Dealer and Repairer



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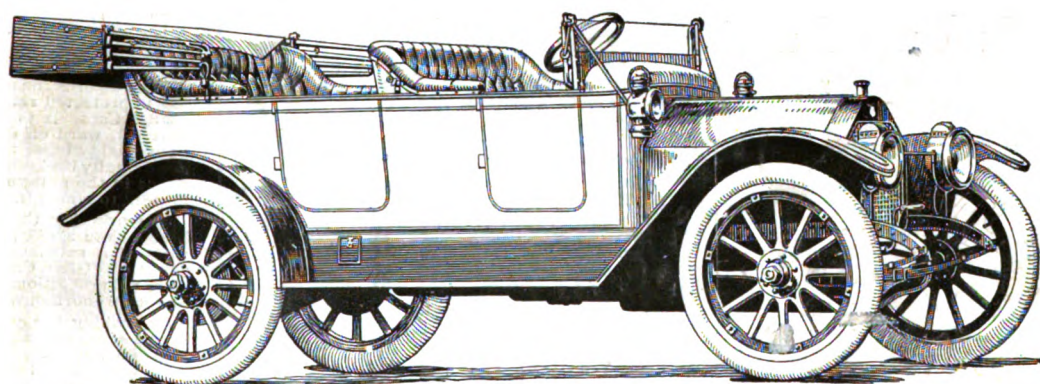
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THE MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Vol. 14, No. 2.

NEW YORK, OCTOBER, 1912.

Monthly, \$1.00 per year.
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Left hand drive
Center control
Long stroke silent motor
Selective transmission
116-inch wheelbase
36-inch wheels

Demountable rims
French design body
Black and nickel trim
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Turkish cushions
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Self-starter
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side curtains

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Tire carrier and protector
Extra tire rims

The "40" is made in two body styles. The Touring Car, \$1675, and the Roadster, \$1625. We also make a "30" Touring Car, \$1145, and Roadster, \$1110; a "22" Roadster, \$785. All cars fully equipped, prices f.o.b. factory.

You should buy a Maxwell because

It lasts longest—proven by actual State registrations.

It holds the world's speed record in its class. It is the national touring champion—winner of the Glidden Tour.

It costs less to maintain—proven by public demonstration.

Deliveries Now

Dealers everywhere are prepared to make deliveries at once. We will be glad to send you the Advance Catalogue for 1913. Write for it.



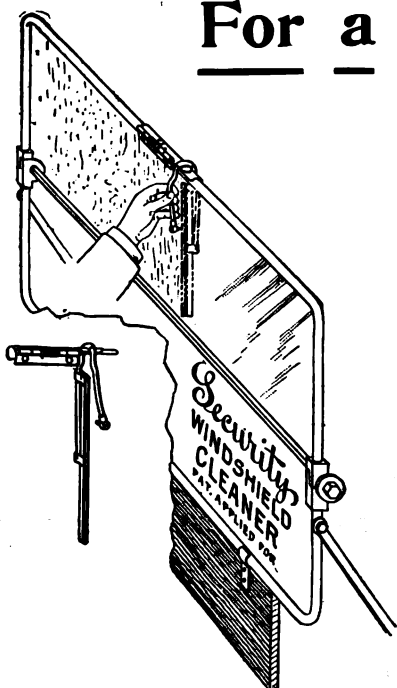
United States Motor Company
Maxwell Division

6 West 61st Street

New York City



For a Clear Shield on a Rainy Day



you need THE SECURITY WIND SHIELD CLEANER.

Without it you must either *stop your car frequently* to wipe the rain or snow off your shield, or keep your shield down and expose yourself and guest to a drenching or cold.

THE SECURITY WIND SHIELD CLEANER enables you to enjoy the comfort and protection afforded by your shield, because the guiding arm may be *worked from the seat*.

Works like a window cleaner. Its cost is little—its utility its great. Three years on the market. Thousands in use.

Quicker
than hand cleaning.

Better
than glass polish.

Cheaper
than a year's supply
of waste or chamois
skin;

Simpler
and more efficient
than any device on
the market.

**And there is no rat-
tling.**

Use this coupon and

\$1.50 Save 25c.

all dealers

We want you to have a SECURITY WIND SHIELD CLEANER on your car as an advertisement. We know that every one of your motorist friends will buy one after they see how efficiently it does its work. Your dealer will allow you 25 cents for demonstrating purposes when you present this coupon. If he cannot accommodate you promptly, send the coupon and \$1.25 to us and we will deliver the SECURITY CLEANER to you through our nearest dealer.

To all Dealers: The holder of this coupon is entitled to purchase one SECURITY WIND SHIELD CLEANER at \$1.25.

**Emil Grossman
Company, M'fr**

250 W. 54th St., New York

Vanderbilt Cup Race

Wisconsin Challenge Trophy
Blue Ribbon Trophy

WON BY



WINNER
Vanderbilt
Cup
Race

NIGHT LETTER

Milwaukee, Wis., Oct. 4.
Emil Grossman Company,
250 West 54th St., N. Y.
The Red Head Plugs which I
have been using for months
assisted me in winning the
Vanderbilt Cup Race, going
through the entire grind with
no ignition trouble whatever.
RALPH DEPALMA

WINNER
\$500.00
Red Head
Cash
Prize

WINNER
Wisconsin
Motor
Challenge
Trophy.

DAY LETTER

Milwaukee, Wis., Oct. 4.
Emil Grossman Company,
New York.
Won Wisconsin Motor
Challenge Trophy using Red
Head Plugs. As usual per-
fect ignition.
HARRY ENDICOTT.

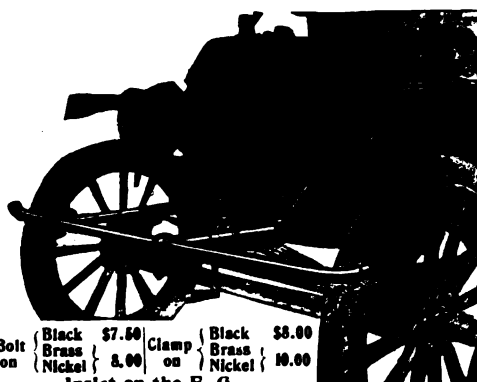
WINNER
\$100.00
Red Head
Cash
Prize

WINNER
Pabst
Blue Ribbon
Trophy

DAY LETTER

Milwaukee, Wis., Oct. 5.
Emil Grossman Company,
250 W. 54th St., N. Y.
Red Head Spark Plugs des-
erve part of the credit for my
winning the Pabst Blue Rib-
bon Trophy Race with my
special Mason Car. Everyone
of the eight plugs worked
perfectly throughout the
grinding race and Red Heads
are the only plugs that have
not cracked or blown out in
my high speed, high compres-
sion motor. I wish to con-
gratulate as well as thank
you for the service your plugs
gave me. Sincerely,
MORT ROBERTS.

WINNER
\$100.00
Red Head
Cash
Prize



Bolt	Black \$7.50	Clamp	Black \$8.00
on	Brass 8.00	on	Brass 10.00
	Nickel		Nickel

Insist on the E. G.

E. G. Ford Bumpers

The Cheapest Accident Insurance.

A Bumper is the surest safeguard for the unprotected radiator and lamps of FORD Cars. It is the "strong arm" that will ward off damage if your car unavoidably bumps the car ahead, or is accidentally backed into, or when moved about in the garage while you are not present to watch it.

In marketing the ECLIPSE BUMPERS for the FORD, we realize that for want of a satisfactory Bumper, thousands of FORD Cars are lacking this essential protection, and the demand is therefore enormous.

By making the quantity we can produce a quality bumper in design, material and finish heretofore confined to Bumpers made for high-priced cars only.

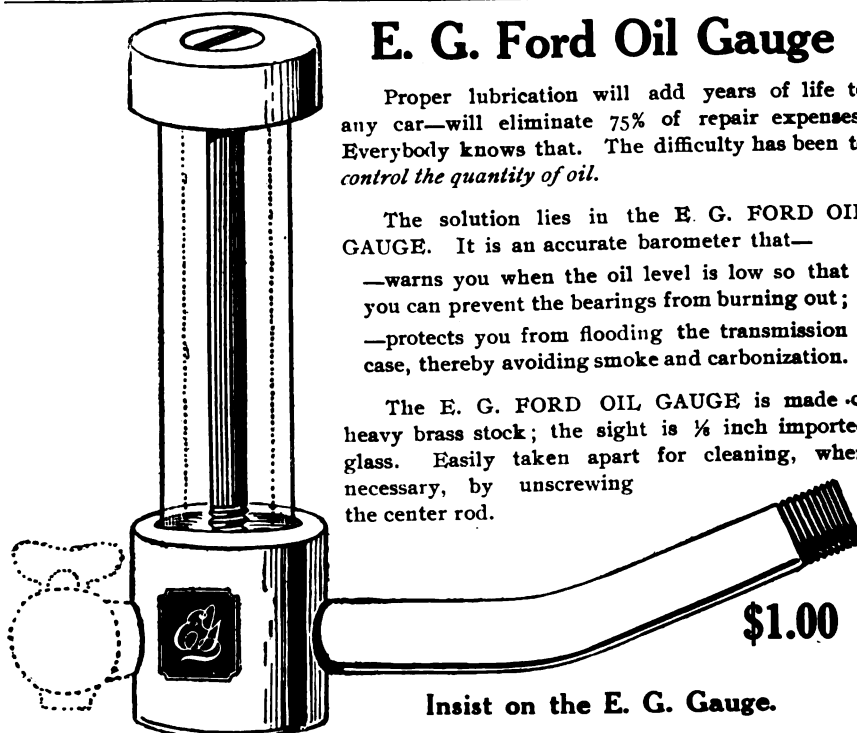
E. G. Ford Oil Gauge

Proper lubrication will add years of life to any car—will eliminate 75% of repair expenses. Everybody knows that. The difficulty has been to control the quantity of oil.

The solution lies in the E. G. FORD OIL GAUGE. It is an accurate barometer that—

—warns you when the oil level is low so that you can prevent the bearings from burning out;
—protects you from flooding the transmission case, thereby avoiding smoke and carbonization.

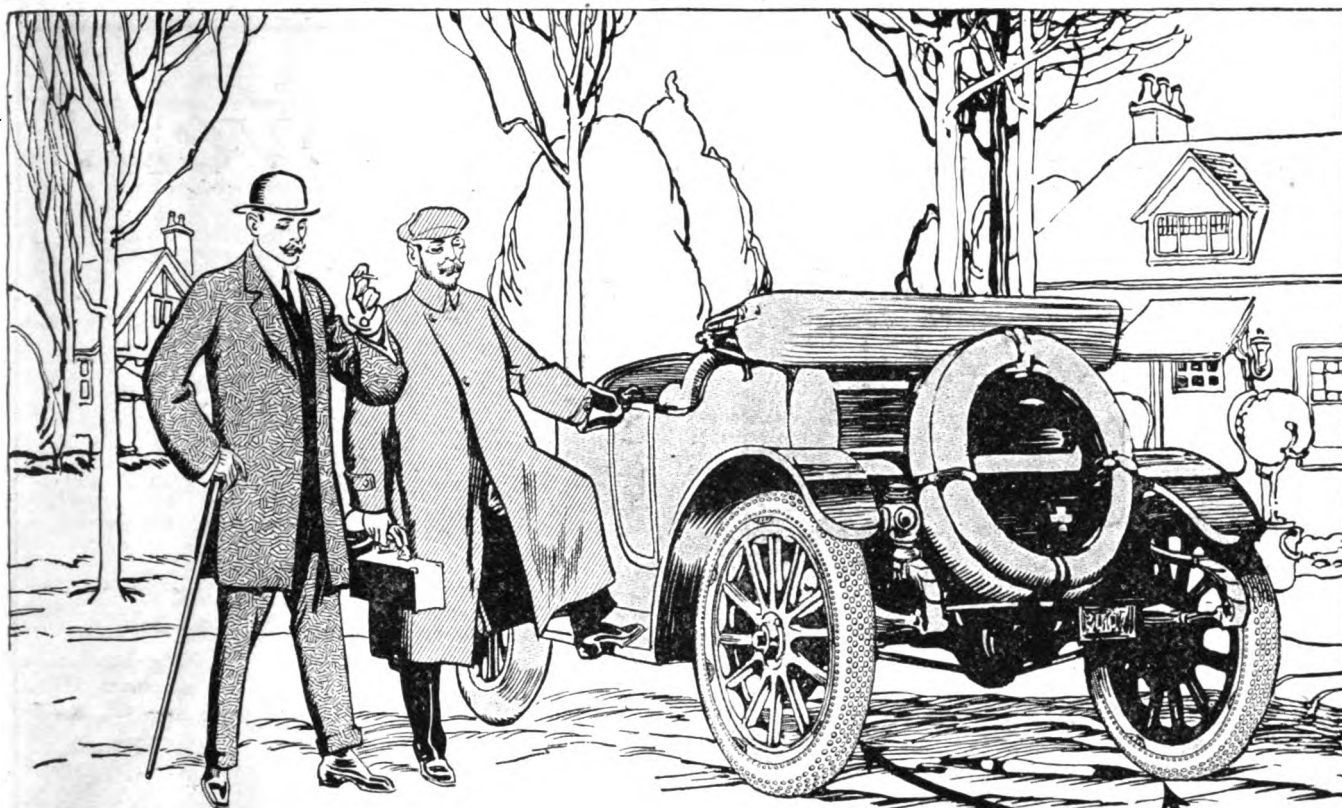
The E. G. FORD OIL GAUGE is made of heavy brass stock; the sight is 1/8 inch imported glass. Easily taken apart for cleaning, when necessary, by unscrewing the center rod.



\$1.00

Insist on the E. G. Gauge.

EMIL GROSSMAN COMPANY, Manufacturers, 250 W. 54th Street, New York
Factory, 844 Woodward Avenue, Detroit, Michigan



"I could not take care of my practice if it were not for Woodworth Treads."

So say thousands of busy physicians today.

They know the value in time and money of being able to use one set of tires from 10,000 to 20,000 miles without repairs. They know that Woodworth Treads, plus tires, cost less per mile than bare tires alone. They know the value of being always ready for wet weather without the nuisance of attaching chains.

What is good for physicians is equally good for any man who uses his car for business, or who drives a great deal, or who cares for his machine in person.

Nothing since pneumatic tires were invented has overcome their faults and preserved their virtues so well as

Woodworth Treads

They eliminate skidding, punctures, cuts, and premature decay of fabric. They last as long as bare shoes and cost half as much. They lengthen the life of new tires three-fold.

Woodworth Treads consist of a soft leather base into which hardened steel studs are riveted. Their vital feature is their method of attachment by stiff side springs, which permanently prevent chafing and heating by keeping the treads always snug on the tires.

We guarantee the Treads as to wear, and will repair or replace free any tire damaged by them when applied as we direct. Or we will take the Treads back within 30 days after purchase and refund your money. All we ask is that you test them on good tires properly inflated.

Instead of new pattern tread tires this Fall, get Woodworth Treads and use them on your old tires, after repairing the latter to protect the fabric. You will save half the cost of new tires by doing so.

SPECIAL WINTER TREADS

Next month we shall announce our new Double Grip Treads,—an absolute novelty, designed especially to give a hold in deep snow or in ice. Don't "monkey" with chains! Spare your tires and your purse at the same time, by using the genuinely protective Woodworth Treads.

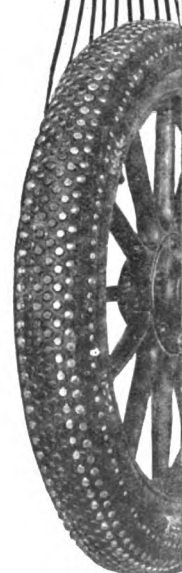
LEATHER TIRE GOODS COMPANY

NIAGARA FALLS, N. Y.

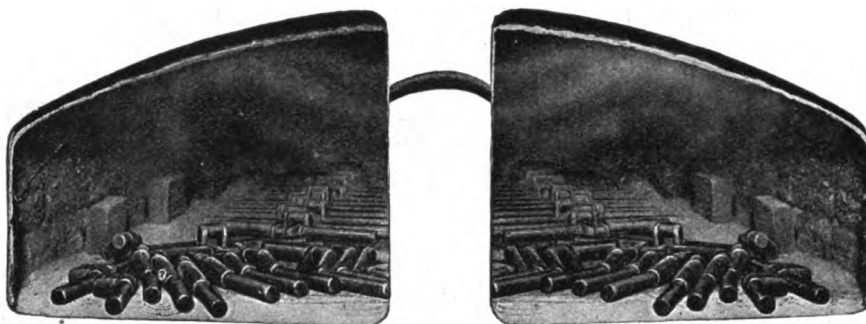
NEW YORK STORE. 1608 BROADWAY.

Good Agents Wanted for Unoccupied Territory.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



The Eyes of the Oven!



Looking out from the Heated Compartments of Treating Ovens at 1500° Fahrenheit.

Work wondrously well done requires foresight,
constant care and pyrometers.

"Vulcan" Heat-Treatment is the climax of such
attention and assures

Superior Drop-forgings

If you are interested in a valuable line of stock

Crank Shafts

Connecting Rods

Valve Stems

Igniter Levers

Rod and Yoke Ends

Mechanics' Auto Tools

Etc.

send for pocket edition (just out) of 1912 Catalogue, or for forgings to
order send your blue prints to us for estimate.



J. H. WILLIAMS & CO.

Superior Drop-forgings

No. 17 RICHARDS STREET

BROOKLYN, N. Y.



Please mention the Automobile Dealer and Repairer when writing to advertisers.

Guaranteed 5,000 Miles Without Puncture

Even Over the Roughest Frozen Roads

Your tire expenses this fall and winter will be tremendous. Icy, frozen roads will cut and puncture them if they are not protected by **Durable Treads**.

If your tires are protected by **Durable Treads** you can travel over the most disastrous frozen roads, with never a fear of puncture, cut or blow-out. You will experience no unpleasant road delays—your tire bills will vanish.

On slippery pavements—in crowded streets—you can control your car. For there will be no slipping or skidding with **Durable Treads**. There will be no need for ruinous, inconvenient chains.

Our Written Guarantee

With **Durable Treads** we will give you a written legal guarantee for 5000 miles without puncture. This is binding whether your tires are new or old, tread-worn, rim-cut or rut-worn.

This means that for 5000 miles, over any sort of roads, your tires cannot puncture, blow-out or become injured.

Durable Treads are the only treads built to protect your tires against rim-cuts, rut-wear and side blow-outs.

The full leather cover prevents gravel and sand from entering, to grind and wear the tire.

With **Durable Treads** the resilience of your tires is just as great—high speed just as easy—cost of gasoline no more.

This is perhaps the most liberal guarantee ever given with a tread. Read it over again! Get its full meaning to you! Figure out what it will save you each season in dollars and cents.

We are able to give you this guarantee in black and white—binding—bona fide—because **Durable Treads** every day, on thousands of cars, are proving that they can make good. This is because **Durable Treads** are different, absolutely, from all others.

Your Annual Problem Solved

Each season you are face to face with the same old problem—new tires. Each season you must pay \$50 to \$200 for a new set.

But this problem can be solved through **Durable Treads** at half the cost of tires. If your tires are now worth keeping—unless they are shot to pieces—**Durable Treads** will make them wear 5000 miles more without puncture.

So do not abuse them another day—do not run them unprotected until they are useless—or you'll throw away \$50 to \$200.

If your tires are new, **Durable Treads** will save them—give you three seasons wear instead of one.

Construction

1.—Extra heavy tread strip covers wearing surfaces, adding 50% to the life of protector.

2.—Three to five plies of Tire Fabric prevents stretching or sagging.

3.—Hardened Steel Rivets, closely set on Tread surfaces, prevents skidding.

Construction

4.—Full leather cover protects tire against ruts and blow-outs.

5.—Nickel Steel Rim attachment places driving strain on wheel, instead of on worn, weakened tire. It also prevents rim-cuts and blow-outs.

Durable Treads

Tire Expense Reduced Half

Your tire expense is now actually 1½ to 4 cents per mile. It is greater than that of gasoline and oil combined. Yet it can be eliminated through **Durable Treads**. For with **Durable Treads** punctures, blow-outs and tire repairs will be eliminated.

If you'll stop to figure out what that means, you'll find that you spend enough on repairs alone each season to almost maintain your car.

Forcing Recognition!

Every day the list of **Durable Treads** converts are growing. And only because **Durable Treads**, through their remarkable advantages—are forcing that recognition. Car owners are awakening to the fact that they can save that 1½ to 4 cents per mile.

The cry we have always heard about tire expense is becoming fainter.

This season our sales are doubling month by month. For our owners now realize that **Durable Treads** are not an experiment, but a proven quantity—a most vital factor in automobile construction. They should soon become part of the standard equipment.

Cost Half Of Tires

A set of tires costs \$50 to \$200. But **Durable Treads** cost less than half that. Hence, isn't it more economical to protect these costly, delicate tires?

Isn't it more economical to buy **Durable Treads**, at half the cost of tires, than to buy new tires each season? **Durable Treads** are a leather and canvas cover—studded with steel rivets—that covers the entire tire, just as it stands on your car.

Test At Our Expense

We want you to know just what **Durable Treads** are before you invest a cent or promise to buy.

We will ship you a pair or full set, with your permission, for inspection. We pay all express charges—you are not put to a cent's expense, obligation or trouble.

You make no promises to buy. After you examine **Durable Treads**, if you are not satisfied that they will do all we claim, return them. This examination will cost you nothing.

Special Discount

If **Durable Treads** are not already represented in your territory, we will make shipment to you direct from the factory and allow you our full dealers' discount on your initial order.

This is merely to introduce them. It is an excellent opportunity for you to equip your car at almost cost.

It must be taken advantage of immediately, for the inquiries and orders each day are rapidly filling all territories.

Send Coupon For Facts

We have explained to you without exaggeration just what **Durable Treads** will do! We have shown you how to save \$50 to \$200 each season.

Now we want you to send the coupon to us at once for copy of our legal guarantee and other conclusive proofs. We will send you a sample of **Durable Treads** leather. If you can rip it, you must be unusually strong. Simply fill in and mail the coupon—but be quick!

If you live west of the Mississippi, address our Denver Office; if east, address Chicago.

COLORADO TIRE & LEATHER CO., 1208 Majestic Bldg., Chicago, Ill.; 1027 Broadway, Denver, Colo.

COLORADO TIRE & LEATHER CO., 1208 Majestic Bldg., Chicago, Ill.; 1027 Broadway, Denver, Colo.

Dear Sirs:—Please send me at once, without obligating me, sample of Durable Tread leather, booklet, copy of guarantee, price of Durable Treads and special discount offer.

Name..... Street Address.....

City..... State.....

My Tire Sizes are.....

This is what will happen to your tires this winter.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

The incomparable 400 Blower, the one greatest Heirloom that will be handed down from one Generation to the other. Ask what the owners say.

The 400 Steel Blower will serve the youngest mechanic faithfully without expense for a long lifetime.



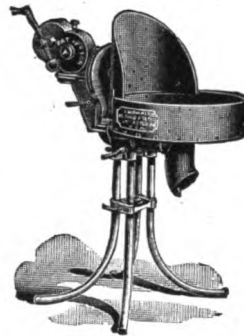
Crank turns either way

The Famous 400 Champion Steel Blower



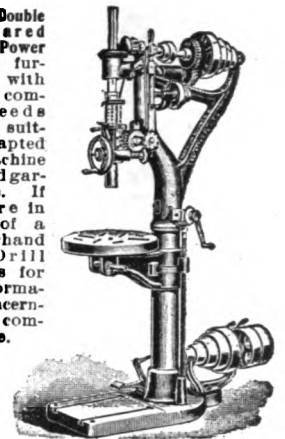
No. 408 Steel Blacksmiths' Forge

Over one-half million 400 Champion Steel Blowers and Steel Forges in use. Forever run easy, smooth and noiseless.

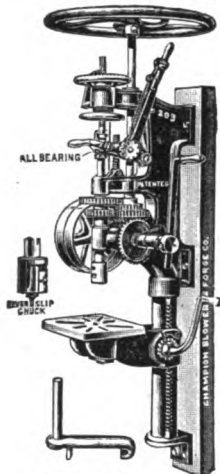


No. 401 Steel Rivet Forge

20-inch Double Back Geared Upright Power Drill is furnished with three complete feeds and is suitably adapted for machine shop and garage use. If you are in need of a power or hand driven Drill write us for full information concerning our complete line.



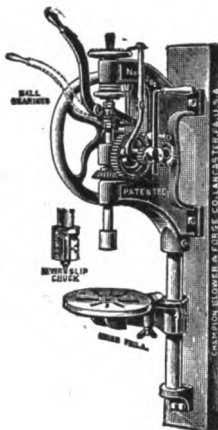
20-inch Drill



No. 203 Self-Feed and Double Compound Lever-Feed Drill

Champion "Patent d" Automatic Self-Feed and Lever-Feed Upright Post Drills.

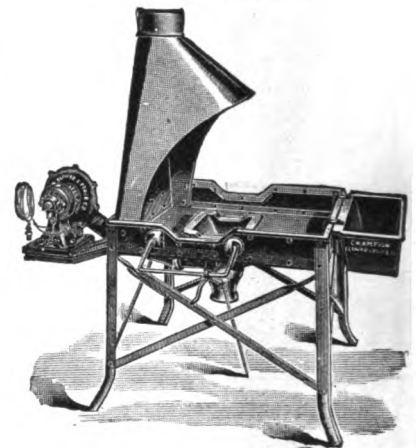
Made with Ball Bearings only. With the Lever- or Automatic Self-Feed 95 per cent in Time and Labor is saved by the Instantaneous Raising of the Drill Bit out of the hole just bored and again replacing the drill bit back on the material ready to bore the next hole. Remember—There is NO TURNING BACK of the Screw NUT with EITHER FEED. All the Leading Dealers Carry a Stock of CHAMPION GOODS.



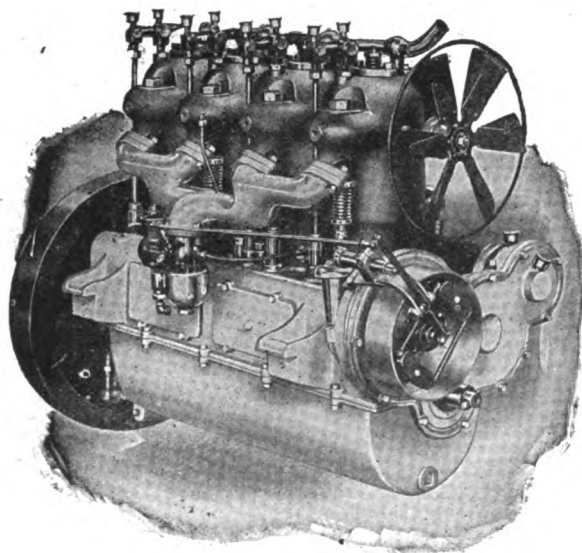
No. 200 Lever-Feed Drill

Before purchasing a Hand Blower, Forge, Drill Press, Tire Bender, Tire Shrinker, Screw Plate, Power Blower or Electric Blower, write for our free catalogue, which always shows the greatest variety of improved blacksmith tools built under one control in the world.

THE CHAMPION BLOWER & FORGE CO.,
LANCASTER, PA.,
U. S. A.



No. 440 Electric Forge



No. 11.—Single cylinder, stationary engines, 2 to 125 H. P.

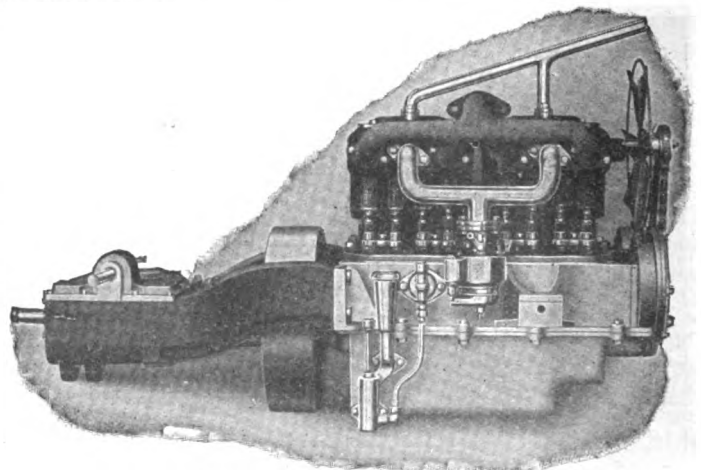
That we furnish engines for farm tractors, railway locomotives and commercial vehicles of all kinds, is evidence of the range of our work and the stability of our construction.

Model Gas Engine Works
Lock Box 2002, PERU, IND.

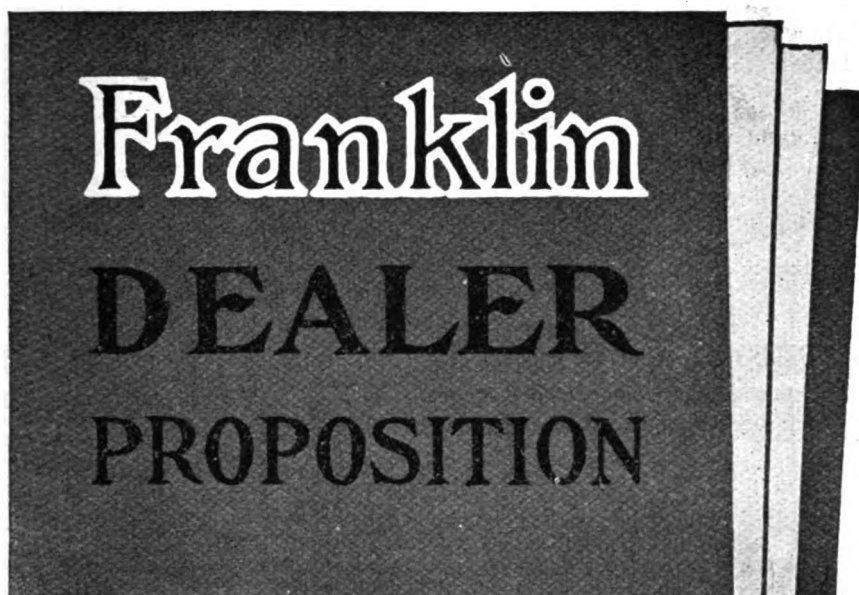
OUR LINE IS COMPLETE.

WRITE for the following catalogs of the line in which you are interested:

- No. 18.—General construction of all motors from 3½x4½ to 5x6, cone clutches and transmissions.
- No. 20.—30 to 40 H. P. unit power plants with 4 forward speed transmissions and governor.
- No. 21.—22 H. P. unit power plants with 3 forward speed transmissions.
- No. 19.—Wells clutch.
- No. 17.—4 cylinder, marine engines, 12 to 500 H. P.
- No. 16.—4 cylinder, stationary engines, 12 to 500 H. P.
- No. 15.—4 cylinder, stationary engines (suction gas type), 25 to 500 H. P.



Please mention the Automobile Dealer and Repairer when writing to advertisers.



Send the Application Below

No matter what cars you *now* handle—get the Franklin Dealer Proposition. Franklin dealers make money—and have a permanent, steadily increasing business.

Franklin is now the third largest selling high priced car, and gaining rapidly on second. Satisfied owners and successful dealers are a winning combination.

Franklin cars are easy to sell because (1) use less gasoline, averaging 20% to 35% more mileage per gallon; (2) use less oil, averaging 400 miles per gallon, without smoke; (3) use fewer tires, averaging 8000 to 10,000 miles per set, the 1911 record; (4) travel faster in the long run, owners thinking little of making 200, 300 or even 350 miles and more per day, without fatigue; (5) ride easier, bowling along so smoothly and comfortably, without jolt or jar, that driver and occupants do not realize that they are steadily traveling 30, 35 and 40 miles per hour; (6) and wear longer than other cars, depreciation being much less, due to the intelligent, scientific use of carefully selected materials.

We will send full particulars of the Franklin Dealer Proposition to any automobile dealer, garage owner or automobile owner financially capable and with the business experience to become a successful dealer, provided he will fill out this coupon and mail to us immediately.

The sending of this coupon does not obligate the sender or us. It is merely a convenient way to get all the facts.

FRANKLIN MODELS AND PRICES

Franklin cars are built in four models on five chassis sizes:

List	List
D Touring, 6 cylinders, 38 H.P., 5 passengers, \$3,500	H Limousine, 6 cylinders, 38 H.P., 5 passengers inside \$4,750
D Torpedo phaeton, 6 cylinders, 38 H.P., 4 passengers, 3,500	M Touring, 6 cylinders, 30 H.P., 5 passengers, 2,800
G Touring, 4 cylinders, 25 H.P., 5 passengers, 2,000	M Torpedo phaeton, 6 cylinders, 30 H.P., 4 passengers, 2,800
G Runabout, 4 cylinders, 18 H.P., 2 passengers, 1,650	M Roadster, 6 cylinders, 30 H.P., 2 passengers, 2,800
H Touring, 6 cylinders, 38 H.P., 7 passengers, 3,750	

FRANKLIN AUTOMOBILE CO., Syracuse, New York

SEND THIS APPLICATION

FRANKLIN AUTOMOBILE CO., Syracuse, N. Y.

Without obligation to me, please send your "Dealer Proposition" as advertised in October issue of Automobile Dealer and Repairer.

Name

Address

References

1

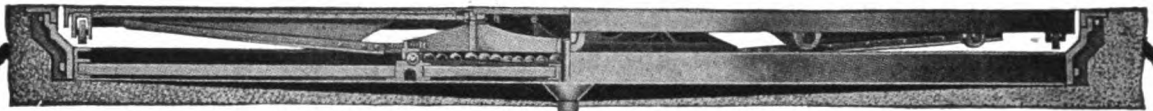
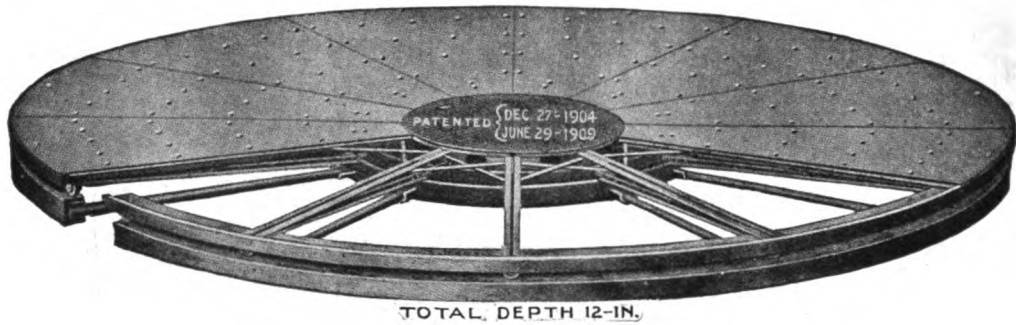
2

3

I handle the following cars:

.....

Please mention the Automobile Dealer and Repairer when writing to advertisers.



The "UNIVERSAL" Table

Universal Automatic Turntables are best because:—They are strongest and simplest in construction, easiest to install, and so easy to turn that a 12-year girl can turn a "Universal" with a heavy truck or touring car on it.

Made in four sizes—a size for every use and every car. Get our Catalog "C-1" on "Universal" Garage Equipment. Send to-day; you need it.

THE CANTON FOUNDRY & MACHINE CO., Canton, Ohio

Whenever you see the word TIRE your first thought is EXPENSE—

But--Think of the Saving GILMER TIRE REPAIR PLIERS

and 5 minutes time each week can accomplish. Isn't it worth while to save 50% of your tire expense? Over 600,000 Sets of Rubber Gum were used during the past year for repairing small cuts in Automobile Tires. Over 300,000 people used them. The largest part of these were put into the cut by hand—and it's a dirty, disagreeable and unsatisfactory job.

We've never received a complaint on these pliers. However, we decided to make them better—

HERE THEY ARE.



New Style—
100% Stronger—Ratchet in Handle Holds Them Open.
SAME PRICE. (Patented).

GILMER TIRE REPAIR PLIERS

are filling a long-felt want—you can wear white gloves with no danger of soiling and you NEEDN'T BEND OVER. Consequently, during the next year double the amount of gum will be sold and everybody will be repairing their tires, in order to cut expense.

10,000 Miles of Service are built in every good tire made. Do yours last that long?

If you used the same hap-hazard methods in business which you use in having your car repaired and buying your supplies you would not own a car. Just because you can afford a car is no reason why you should buy two sets of tires to run the distance one set should.

In every instance where a tire blows out a close inspection will show that there is a small cut in the rubber envelope, which allows dirt, grease and dampness to get into the fabric and rot it.

We have a guaranteed proposition which should appeal to you. We want to refer our mail orders to Dealers as soon as possible.

G. WALKER GILMER, Jr., Manufacturer, 52 North 7th Street, PHILADELPHIA, PA., U. S. A.

Every argument for cutting expense is a reason for filling out this blank TO-DAY.

G. WALKER GILMER, Jr.

Gentlemen:—Enclosed please find \$1.00 for which send me one pair of GILMER TIRE REPAIR PLIERS and Cleaner, with a copy of "Tire Insurance."

My Dealer's name is.....

Address.....
This order is placed on a satisfaction guaranteed basis.

Name.....

Address.....

DEALERS—Our discounts are right. Your customers are interested. Fill out this blank and save time.

G. WALKER GILMER, Jr.

Gentlemen:—You may enter my order for and ship cheapest waydozen pair of Pliers and Cleaners, with the understanding, that if, on examination, we are not satisfied with your discount, we are to return at your expense. Please quote us on a basis of a sales output of.....dozen per year.

Name.....

Address.....

Please mention the Automobile Dealer and Repairer when writing to advertisers.

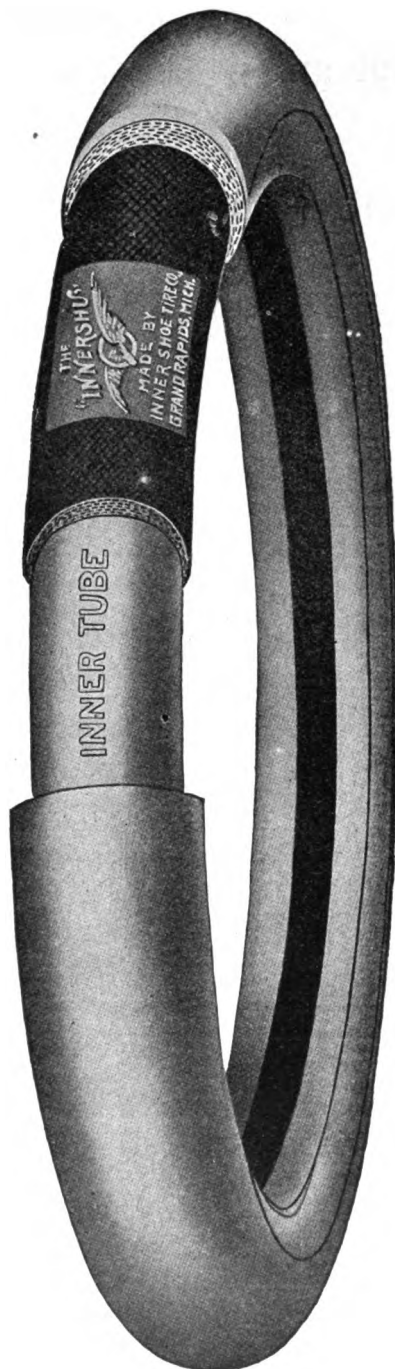


LABEL COPYRIGHT 1908
By
INNER SHOE TIRE CO.

THE TIRE ECONOMY WAY



LABEL COPYRIGHT 1908
By
INNER SHOE TIRE CO.



THE "INNERSHU"

Your Pleasure is doubled when you know that re-enforced by the "INNERSHU" your chances of getting out and home without trouble is increased fully 90%.

TIRE INSURANCE

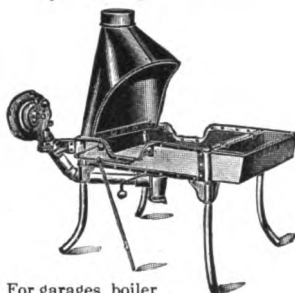
We absolutely guarantee against punctures, blow-outs and to increase tire efficiency one hundred per cent. This is not idle talk. We are doing it, and can do it for YOU.

Here you have the evidence. Less than 1/10 of 1% returned for adjustment, and made good by us.

THE INNER SHOE TIRE CO. GRAND RAPIDS, MICH.

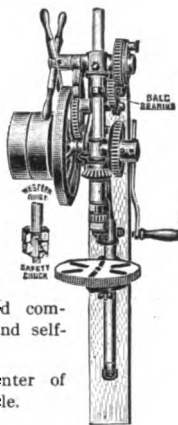
Please mention the Automobile Dealer and Repairer when writing to advertisers.

Royal (Steel) Forge No. 37



For garages, boiler makers, horse shoers or any first-class forge shop.

No. 19 Drill



A low priced combined hand and self-feed drill.

Drills to center of 16 1/4-inch circle.

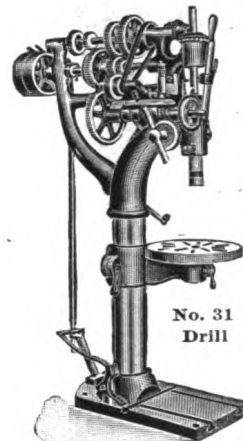
When in need of a
FORGE, BLOWER,
DRILL, PUNCH,
Or SHEARS,

for your garage or repair shop, purchase a Canedy-Otto and get the best.

There is a reason—QUALITY.

Send for Catalogue.

CANEDY-OTTO MFG. CO.,
CHICAGO HEIGHTS, ILL.



20-inch upright drill, gear driven. No belts. Has hand lever-feed, also power self-feed with automatic stop.

No. 1 Shear



For cutting flat and round bars.

Seamless Steel Tubing

Over 1,000,000 Feet on Hand.

SEND FOR OUR LIST.

1500 SIZES.

YOUR SIZE IS HERE.

ALSO COLD DRAWN SEAMLESS TOOL STEEL TUBING.

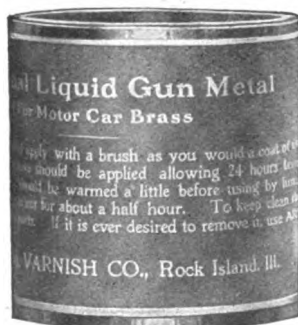
WRITE NEAREST OFFICE

GEORGE NASH CO.,
217 Pearl Street
New York City

EDGAR T. WARD & SONS
25 Purchase Street
Boston, Mass.

FIELD & CO., Inc.
118 N. Seventh Street
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TIRED OF POLISHING BRASS?



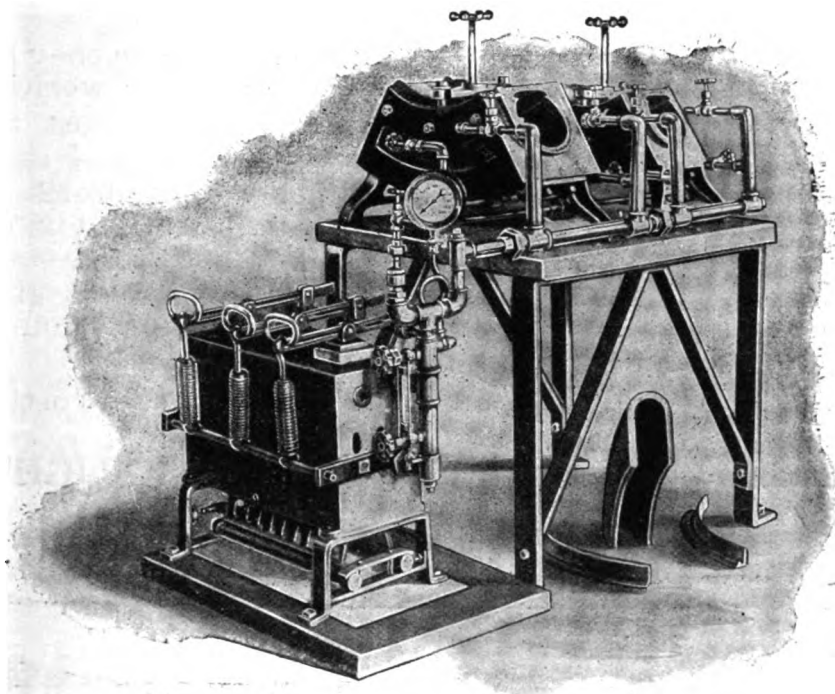
With Arsenal Liquid Gun Metal on your lamps and radiator you have no polishing to do. It is applied with a brush the same as paint or varnish and makes a lasting gun-metal enamel on all brass parts. Can be removed at any time without injury to the brass. Is gun metal in color, but dark enough to supply any demand for black as well. Used and endorsed by thousands of motorists. If not at your dealer's \$1 brings a can express prepaid. Liquid Gun Metal is the standard material for enameling motor car brass. Don't pay a painter \$75 to paint your car. Do it yourself with the Arsenal system. Ask us how.

ARSENAL VARNISH CO., 2501 4th Ave., Rock Island, Ill.

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TIRE REPAIR MEN ARE MAKING MONEY. Right now and for the next two months this business will be at its best. Tires that were new in the spring need repairs. Auto owners are repairing tires to make them last out the season. An increasing number of cars will be run all winter.



No. 5. EQUIPMENT FOR GAS OR GASOLINE.

We have many other outfits, both self steam generating and for an independent boiler.

YOU OUGHT TO SHARE IN THE PROFITS. Install an Akron-Williams outfit, the kind used and recommended by twenty-seven out of thirty tire makers and by successful repair men everywhere. Ask your tire maker about us.

IT DOESN'T TAKE MUCH MONEY to buy the best plant and you can make more with it than with an investment four times as large in any other line. We have outfits from \$40.00 to \$1000.00, depending upon how much and what range of work is to be handled. Every outfit is standard.

GET INTO THIS PROFITABLE BUSINESS NOW.

Write Today for Catalogue 121.

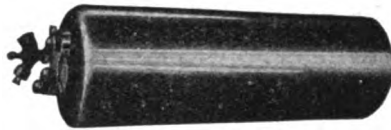
"IF IT IS USED TO REPAIR TIRES, WE MAKE IT."

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GLENDAL AVENUE . . . AKRON, OHIO

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Are endorsed by Auto Owners everywhere because they are the best and most economical gas lighting tanks made in the world.

A clean, steady, **White Flame** for two auto lamps at a cost of **ONE CENT** an hour.

Your choice of nickel or copper finish. Sizes, 6x22 inches and 6x18 inches. Also a motorcycle size, which is fine for carriage or buggy.

The owner recharges it anywhere, any time. It is automatic in action, low pressure, and safe. No waiting. No express on recharges.

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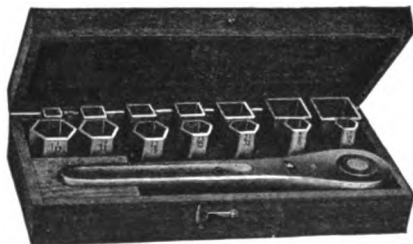
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This New Ratchet Wrench

Is surely a wonderful improvement over the previous socket-wrench handles.



Do you use Socket Wrenches at all? You *would* if you could try our No. 12 set, illustrated herewith.

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For Catalog 143



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IS CERTAIN IF YOU HAVE COMPRESSED

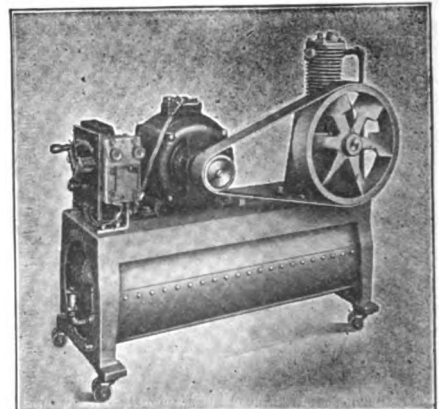
Air Always on Tap

Free to your patrons.—It's a way they have of showing their appreciation, besides it saves much labor around the garage.

We can furnish the Curtis common-sense garage air pump in 2x2½ and 3x3½, either the compressor alone for belting direct to motor or line shaft, or as a self-contained air unit mounted on castors with motor, starting box and air tank complete; or on short-leg base with motor, compressor, governor, air tank and starting box, with or without automatic starting and stopping device that automatically starts up the compressor when the air pressure drops and stops it when the pressure reaches the set maximum.

Write for full details and prices.

CURTIS & CO. MFG. CO., 1530 Kienlen Ave., St. Louis, Mo.



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K&W RELINERS

$\frac{1}{2}$ of 1%

That's the number of replacements that we have had to make during the four years we have had K & W Reliners on the market. The best of material, combined with the best of workmanship, are responsible for the superiority of K & W Reliners.

When a dealer tries to sell you "something just as good" as "K & W"—take the hint. Write us direct. Don't wait for blow-outs and punctures, but reinforce your tires now. Take time by the forelock and double your mileage. K & W Reliners will add 3000 to 5000 more miles to your tires—service practically equal to that given by new standard made tires.

The fabric is the life of the tire. By reinforcing the fabric you get many additional miles of service, besides making punctures and blow-outs impossible. K & W Reliners will easily reduce your tire expense 50 per cent.

When placed in an old casing, a K & W practically vulcanizes itself to the inner fabric and covers up all the cracks and worn spots; reinforces the whole tire in exactly the same way that an inside blow-out patch reinforces one weak spot.

The exclusive features found in K & W Reliners are fully covered by patents and cannot be found in any other reliner made. Every K & W Patented Reliner is backed by our positive guarantee of service and satisfaction.

Dandy Reliners.

As there are many instances where a Reliner would do all work required by reinforcing and preventing punctures (and sometimes not necessary to be made of as good material as our K & W Patent Reliners) we have decided to manufacture a reliable, low priced tire-reinforcement and have succeeded so well that "price and quality" will satisfy any one who is satisfied with any other tire protector on the market.

The Dandy Reliner is built wide. It will reinforce the casing at the edges. It is made of from three to five plies of heavy rubber duck. It is neatly made. It will fit the tire perfectly. It is heavily coated with cement—all ready to insert. It is semi-cured and very pliable. You will be well pleased with the Dandy Reliner.

We also manufacture a LIGHT WEIGHT Reliner made of "two" layers. The LIGHT WEIGHT is excellent for a tire that is "Rough Inside."

PRICE LIST.

	Dandy Reliner	Light Weight Reliner
28x2½.....	\$2.60	\$2.40
28x3	3.10	2.90
30x3	3.40	3.25
32x3	3.60	3.30
28x3½.....	3.90	3.50
30x3½.....	4.05	3.60
32x3½.....	4.30	3.75
34x3½.....	4.50	3.85
36x3½.....	4.70	4.00
30x4	4.90	3.60
31x4	5.20	3.80
32x4	5.40	4.00
33x4	5.50	4.20
34x4	5.70	4.30
36x4	5.85	4.40
34x4½.....	6.30	4.55
36x4½.....	6.65	4.80
34x5	6.80	4.85
36x5	7.00	5.25

Write for our K & W Tire Accessory Catalog, containing prices of our "Patent" Reliners. See your Dealer—if he does not sell K & W PRODUCTS, write us for a special price.

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Denver Branch: 1545 Broadway, Denver Colorado

MAIN OFFICE AND FACTORY: 3rd Street, Ashland, Ohio

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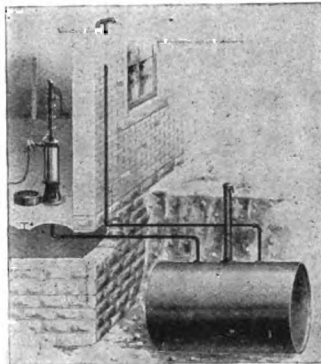
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THE MILWAUKEE is in extensive use among the foremost Garages, Factories, Railroads, etc., in various parts of the country, and carries a strong guarantee of *Satisfaction*.

You need this approved system for safety, saving and convenience.



Write for Catalog today.

**MILWAUKEE TANK WORKS,
Milwaukee, Wis.**

Complete Equipments for Garages, Factories, Railroads, and all Oil Users and Dealers.

HOW TO PREVENT TIRE TROUBLES

Is very clearly and fully explained in our little booklet

**"THE CARE AND
WEAR OF TIRES."**

If you own an automobile, you cannot afford to be without it, as it will help you to

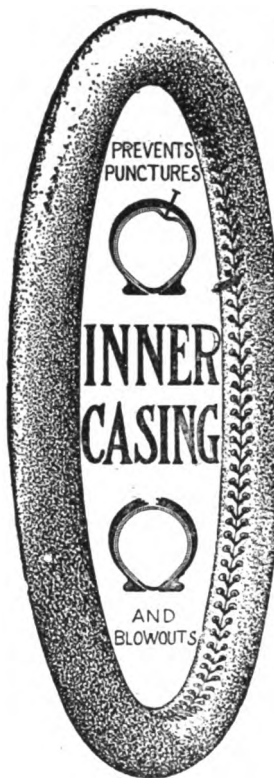
**REDUCE TIRE EXPENSE
50% to 75%.**

It tells you how to make new tires last 10,000 miles and over. It explains how to wear out your tires without the great annoyance of blowouts, and how to keep your tires in proper repair.

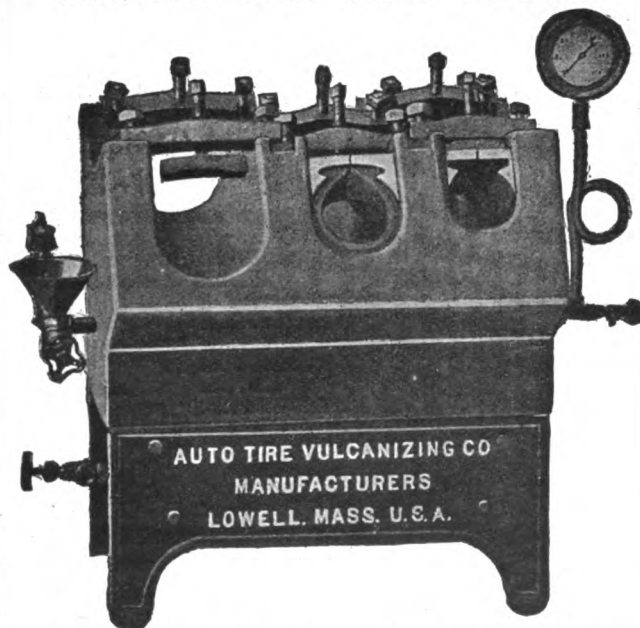
We will send a limited number of these valuable little booklets FREE. postage paid, on request.

**WESTERN AUTOMOBILE
SUPPLY CO.,**

**3900 Sheridan Road
CHICAGO, ILL.**



Our New No. 8 Adjustable Sectional Vulcanizer With Three Cavities



As a Progressive Business Man you should by all means use, handle or recommend our

New Improved Auto-Tire VULCANIZING MACHINE

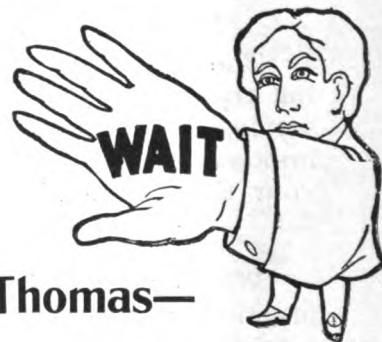
simply and solely because it is the best there is in Vulcanizers at any price and because the price isn't much, the operation is easy and profits are exceptionally large.

Our machine is different, far better and more economical in operation and investment cost than any other made. In all features it is so superior to all other devices there is hardly a comparison. We have some facts that will interest you and that will put you in the way of big profits. In your own interest, get posted—Write to us to-day.

Auto-Tire Vulcanizing Co., Lowell, Mass.

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Skeptical of the claims for superiority of ENDURA SHEET PACKING, under oil and water conditions?

Seeing is believing, and you can soon be convinced if you will but give it a trial.

Leading automobile and pump manufacturers, gas companies and others, now realize what a saving can be effected from the use of ENDURA, and are using it to the exclusion of other packings.

It is the best by test.

Send for samples and try it.

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Don't Throw Away Your Worn-Out Annular Ball Bearings

Have them REGROUND and made as good as new.



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Something you ought to know



Treat
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A post card
will bring
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Tire Trouble.

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GRIND YOUR VALVES WITH GRYNDYN

and give your engine a
chance to show you.

In screw top tin boxes.



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This is
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CUTS FAST

and produces a smooth, even surface.

GRYNDYN

IS
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SAVES TIME

Full directions with every box.

PRICE - 35 CENTS, POSTPAID

Also put up in 1 lb., 2 lb. and 5 lb. cans.

THE OWEN VALVE GRINDER

Makes valve grinding a pleasure. Weight 3½ lbs.

No pressure required. Easy to use. Just rotate between the hands. Simple in construction and cannot get out of order.

Made of the finest steel and thoroughly warranted.

PRICE, EACH \$2.00

Including spring for lifting valve.

SOLD BY ALL UP-TO-DATE SUPPLY DEALERS

Manufactured by **STEWART & CO.**

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New York

TRY IT FREE FOR 30 DAYS ON YOUR CAR

THE MACO

Carburetor

SEND NO MONEY.

We only want you to try it for 30 days without any obligation or expense on your part to purchase.

You don't have to take our word for it that the MACO will show greater efficiency and economy than the carburetor you are now using—test it out yourself.

Its efficiency at all speeds; its greater economy; its ease in starting will readily convince you that the MACO is superior to any carburetor on the market. There's no tubes to clog up, no floats to stick, no complicated working parts to wear or catch. The utter simplicity of the MACO, both in construction and operation, is what makes it such a success.

We will allow you 33½ Discount from our list price.

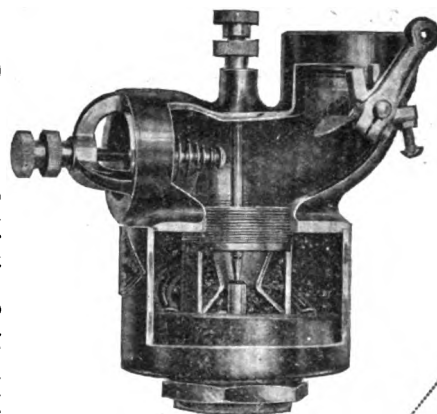
We will send you a MACO carburetor for thirty days' trial. If, at the end of that period, you are satisfied, send us our list price, or if you will send us your old carburetor, we will allow you one-third off our list price for same.

To secure benefit of this remarkable offer use this coupon

LIST PRICES range from \$9.00 to \$14.00, according to size

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OF AMERICA**

74 Warren St., New York, N. Y.



Motor
Appliance
Co. of Am.

74 Warren St.,
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Dear Sirs: Kindly
send me a MACO
Carburetor for thirty
days' trial on my car as
per your above offer.

Make of old carburetor.....

.....Type.....Size.....

Make of car.....

Model.....H. P.....

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One reason for Reliance quality

A skilled potter is working at a lathe with forming tool and calipers, turning the half-hard clay to microscopically exact proportions before it is sent to the ovens to be baked into our heat-defying porcelain. This skilled laborer and his fellow workers draw big pay and are worth it. They are one of the reasons why Reliance Spark Plugs are the best your money can buy.

RELANCE Magneto Plugs—
Supreme in Oily Engines

The secret of the Magneto Plug's efficiency lies in the high quality of the porcelain and the alloy of platinum and iridium we use for making the central electrode that carries the current. We make this porcelain in our own potteries, importing our clays and other ingredients from abroad. No engine can impede the action of this plug, and the central electrode is a solid piece of platinum-iridium. In ordinary practice a mere tip of platinum alone is used. Our electrode is baked in the porcelain by a secret process, which does away with cements, nuts, gaskets and the like, and absolutely prevents compression leakage.

Will you try a set at our risk? We will mail them prepaid on receipt of price and give you an ironclad guarantee of satisfaction or your money back. When writing, specify size wanted or make of car. Our book "Ignition and Spark Plug Talk," mailed free for the asking.



Magneto Type
\$1.25

JEFFERY-DEWITT CO.

53 Butler Avenue,

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Triple Tire Life

That's what you get—three times the wear out of your tires—when you have an

M. & M. Repair Kit

With this complete time, tire and money saving repair outfit you can quickly and permanently repair any slit, any tear, any puncture, any blowout—in any casing or inner tube.

This cold process of repairing is much better, cheaper and quicker than heat vulcanizing. Does not overcure the rubber, take away the resiliency of the tube, weaken it or make it more susceptible to blowouts like heat vulcanizing.

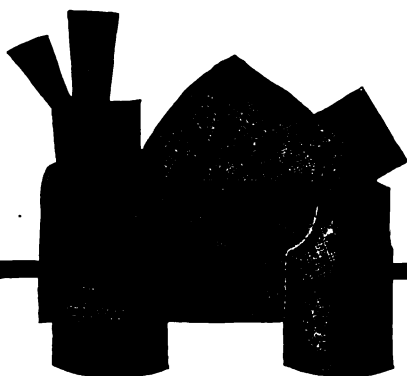
This cold process of vulcanizing is used by all tire concerns to splice inner tubes. Hence its practicability. We guarantee repairs when made according to directions.

PRICE COMPLETE, \$1.00

Sold by all dealers and jobbers or sent direct, express prepaid. Your money back if not thoroughly satisfied.

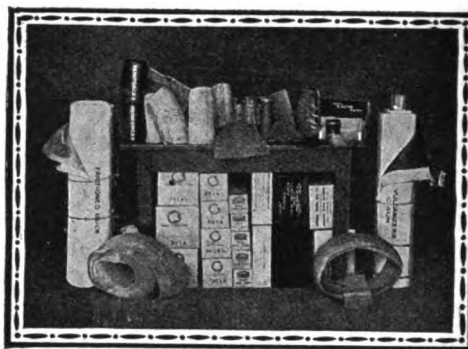
The M. & M. Manufacturing Co.
Dept. C., Akron, Ohio

A postal card will bring our book—
"Money Saving Facts about Tire Repairs."



VOORHEES "IDEAL" AUTOMOBILE RUBBER SPECIALTIES

TO SAVE EXPENSE AND AVOID TIRE TROUBLES



VOORHEES RUBBER MFG. CO.

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MANUFACTURERS OF

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Ask nearest dealer or write to us direct.

The HAGSTROM Rim-Cut Blowout Patch

Positively repairs rim-cuts.

Repairs all blowouts.

Prevents blowouts.

A permanent repair for old casings.

An emergency repair for new casings.

Saves carrying extra casings.

HAGSTROM INSIDE TIRE SLEEVE



"BRINGING YOU HOME IS ONLY PART OF THE SERVICE YOU GET OUT OF THE HAGSTROM SLEEVE"



"THE PATCH REPAIRS BLOWOUTS IF USED IN TIME, WHEN RUBBER FABRIC IS FIRST NOTICED. IT WILL PREVENT A BLOW-OUT OR RIM-CUT AND THUS SAVE INNER TUBE."

Write today for gas tank key and latest price list of Hagstrom specialties.

HAGSTROM BROS. MFG. CO.

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Distributors {LOWE MOTOR SUPPLIES CO., New York City
WESCO SUPPLY COMPANY, St. Louis, Mo.

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A Musical Self-Cleaning Exhaust Horn

A musical, courteous warning, produced by four notes sounded simultaneously—a clear, organ-like chord—that's the signal of the Aermore Exhaust Horn.

Write for free descriptive literature.

The Aermore Horn is built on the pipe organ principal. It operates by a simple pressure of the foot. It is constructed simply—no complicated parts.

Self-Cleaning — Can't Clog

The Aermore Horn is the only exhaust horn on the market that is self-cleaning—that cannot clog. Free space for the exhaust to pass through permits the Aermore to automatically cleanse itself and at the same time does away with back pressure on the engine.

You can regulate the tone of the Aermore to be heard a block away or a mile away—just as you choose.

The AERMORE Exhaust Horn

—the Horn Harmonious—

renders a gentle, melodious call—not a fierce, buzzing screech or squawk. Any chauffeur can attach it in a few minutes.

4 Sizes—\$7.50 to \$12.00

The Aermore is made in four sizes, for engines of different horsepower. It can be used on motor-trucks, automobiles, motorcycles or motor-boats. Can be attached to any exhaust-pipe in a few minutes.

Far lower in price than most auto horns.

15-inch size	\$12.00	11-in. size	\$10.00
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Car Owners: Write us today for free descriptive literature and the name of your nearest Aermore dealer where you can get a free demonstration of the Aermore.

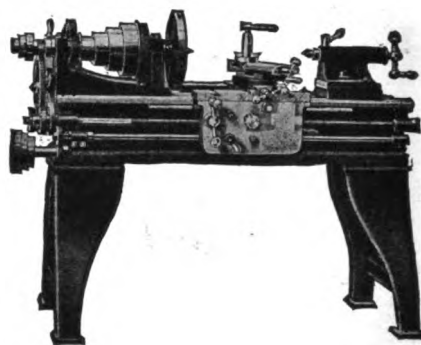
Motor Car Manufacturers: Let us tell you of the merits of the Aermore Exhaust Horn as standard equipment.

Dealers: If you have not yet received our special agency proposition write us at once for full details.

Aermore Manufacturing Co.

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SEBASTIAN 15-INCH LATHE



The LOW-PRICE, PERFECT-QUALITY lathe for the GARAGE and GENERAL REPAIR SHOP.

If you are in the market for a lathe be sure and investigate the merits of the SEBASTIAN.

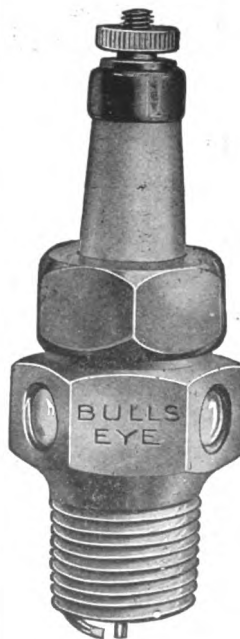
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THE SEBASTIAN LATHE CO.

108-110 Culvert Street, Cincinnati, Ohio

BULLS EYE SPARK PLUG

"The Plug with the Crystal Ports"



Shows at a glance dead cylinders and imperfect combustion.

Aside from special features the best made spark plug on the market.

Ports guaranteed against breakage.

Order a set from your dealer or from us. \$1.25 each, charges prepaid on receipt of price.

G. C. BLICKENSDECKER CO.

STAMFORD, CONN.

HERE'S LONG LIFE TO YOUR TIRES

The life of a tire depends largely on proper inflation. You get it with

The Brown Impulse Tire Pump

Thousands of enthusiastic users endorse the Brown because—



It makes inflating your tires a real pleasure.

It can be attached and detached in an instant.

It inflates to the exact pressure necessary to long life and resiliency for your tires.

It has no complicated mechanism.

It is made of the same materials and in the same careful manner as your motor.

It comes completely equipped with a HIGH GRADE RECORDING GAUGE and a self-opening valve connection.

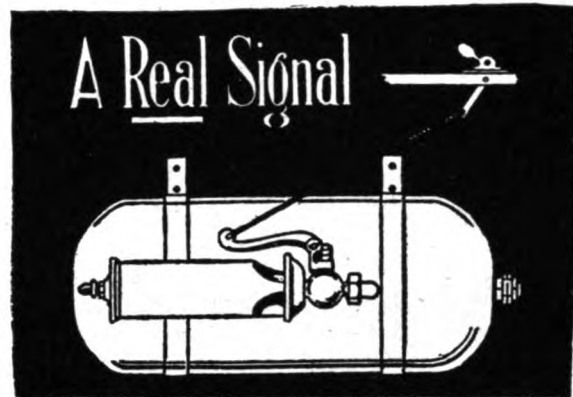
The Brown Impulse Tire Pump is the most economical, efficient and satisfactory accessory you ever used.

ASK YOUR DEALER, OR WRITE US

THE BROWN COMPANY

1100 S. Clinton Street

SYRACUSE, N. Y.



A Real Signal

A new signal for Automobiles, but an old signal in service, the WATRES Power Whistle gives a powerful, compelling blast that cannot be ignored.

The ears of mankind are trained to take warning from a whistle. No other signal can have the same instant effect.

Among a multitude of new devices the power-whistle rings alone with its simple voice of command. Moreover, a whistle blown by stored pressure has from its very nature greater penetrating power than sound produced in any other way.

The WATRES Power Whistle is operated by burned gas from the engine stored in a small reservoir to which the whistle is connected. A touch of the foot pedal operates the whistle and the blast echoes a mile ahead.

Operated by stored power, the WATRES signal is always available. Coasting down hill or around corners or even with car stopped, the power is there—ready for a touch on the pedal.

With the WATRES Whistle goes an accumulator valve which screws into the pet cock opening of one cylinder; the reservoir, 7"x20", enameled any color; a four-tone chime whistle, foot pedal and 6 ft. of flexible copper tubing.

We sell the WATRES Whistle on a definite guarantee—satisfaction or money back after thirty days' trial.

Send at once for Booklet giving full particulars and price.

THE H. E. BOUCHER MANFG. CO.,
Distributors,

20 FULTON STREET, NEW YORK.

We also make above equipment for motor boats. Send for special booklet.

AUTOLINE

TRADE MARK

The Automobile Lubricant that makes for Efficiency in Motoring. Eighty years Oil Making assures it excellence. You can purchase it at most good supply shops—garages—at any of our 14 branches or direct.

Write To-day for the booklet "For your Motor's sake"

WM. C. ROBINSON & SON CO.
1509-1515 THAMES ST.
BALTIMORE, MD.

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Isn't It Worth a Cent To Stop This Wear?



Are worn-out casings worthless? Are blown-out tires fit for the scrap heap only? Not when you know the Triple Tread.

With that tread-worn tire of yours as a foundation, we can build you a **puncture proof** and **non-skid** casing, which, more likely than not, will give you from 1000 to 2000 miles **more service** than your tire would be good for if **brand new**.

Quick service—guaranteed results—and moderate cost! Sounds too good to be true—but—well, just drop us a postal and get the facts in full. Find out today in what way the Triple Tread actually makes an old tire better than new, and how it

Cuts Chunks from your Tire Bills.

French Chrome leather—tough, water-proof and wear resisting—studded with hardened steel studs on the tread, and, flat-headed rivets around the sides—three-ply where the wear is greatest that's the Triple Tread.

This stout, tough, practically wear-proof shield is built onto the worn rubber casing—not riveted on—not laced on—but inseparately united with it by means of our **Steam Heating Vulcanizing Process**, made into one solid, wear-fighting unit, with no patchy-looking outer layers to creep or heat.

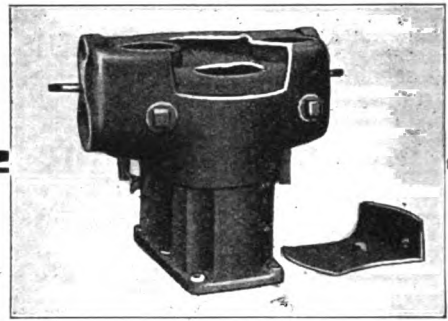
The Triple Tread is a clean-cut success, Mr. Motorist. Will you risk a postal card against our say-so that it's mighty good business to get posted?

TRIPLE TREAD MFG. CO.

1542 Michigan Avenue

CHICAGO, ILL.

Factories: CHICAGO. SAN FRANCISCO, WINNIPEG.



Auto Parts Repaired

Cracked cylinders, axle housings, crank and transmission cases—all metal parts of the car welded and made as strong as new.

Saves Time and Money

Within 24 hours after part is received in our shops, we repair and ship it to you. Illustration shows repair made for Consolidated Motor Co., Bridgeport, Conn. New cylinder costs \$45. Our repair charge was \$15.20. Proportionate saving on all repairs.

Guarantee:—If within one year from date of repair, part is found unsatisfactory, return to us (by freight, collect). Upon inspection, we will cancel all charges, or, if you prefer, do the work over without extra charge.

Write for Full Particulars

Waterbury Welding Company
1148 C South Main St., Waterbury, Conn.

"GRIFFITH'S IMPROVED" —AND— "INDEPENDENT" TIRES

SOLD
ABOUT $\frac{1}{3}$ OFF

NEW APRIL STANDARD LIST.

Have the good points of all other makes incorporated in them. We sell them to you either guaranteed or unguaranteed.

CLINCHERS, DUNLOPS and Q. D. CLINCHERS & TUBES.

Size	Our Unguaranteed	Our Guaranteed	Tubes
28 x 3	\$8.82	\$10.71	\$2.18
30 x 3	9.45	11.48	2.28
30 x 3½	18.90	16.87	3.09
32 x 3½	14.84	18.02	3.25
34 x 3½	16.14	19.59	3.46
30 x 4	19.04	28.12	4.00
32 x 4	20.48	24.86	4.21
34 x 4	21.91	26.61	4.46
36 x 4	28.85	28.85	4.69
34 x 4½	27.76	33.70	5.52
36 x 4½	29.44	35.74	5.81
36 x 5	36.16	43.90	6.81
37 x 5	37.17	45.14	7.06

THE SAME TIRE

Largest dealers of STANDARD MAKES
in U. S.

"INDEPENDENT" guaranteed tubes, 30% off.
Q. D. FLAPS, free.

Goods shipped with examination privilege. Money refunded on goods returned intact within a week.

AUTOMOBILE TIRE CO., Inc.,

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Pour it in. Resume your spin.

The time lost is a mere hesitation.



Se-Ment-Oil has solder and tools skinned forty ways for stopping radiator leaks.

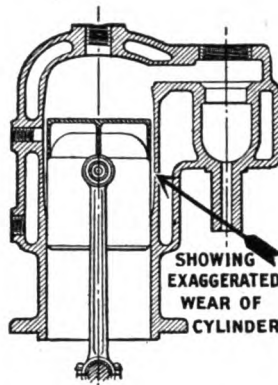
SE-MENT-OL
"CHEMICALLY CORRECT"

Carry it in your car. When the leak starts, stop the car and let Se-Ment-Oil stop the leak. Finds it and fixes it in fifteen minutes.

Price 75 cents at dealers.

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? **Do You Forget** **How The Motor** **Used to Pull** ?



Just try a hill that you used to take on "high" with a full load and see. No doubt, you will notice a difference, a little sluggishness, or perhaps you will have to use a second speed.

Cylinders, pistons and rings will wear, and you cannot get full power from a worn or cut cylinder.

The Remedy

Send us the cylinders to be rebored and fitted with new pistons and rings. Our work can be depended upon. It's first class. The special machinery we have developed rebores the cylinders accurately, and the new pistons with well fitted rings hold and utilize every possible ounce of compression.

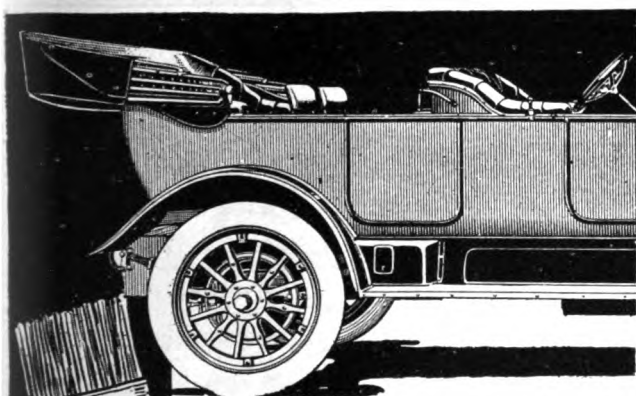
Remember, when you take down the cylinders, that it is "Underwood" work and the "Underwood" process that will restore power to worn or cut cylinders and make your motor **pull, Pull, PULL.**

We have had over forty years' experience in reboring all kinds of cylinders and know the accuracy and careful workmanship that is necessary to make the work efficient.

H. B. Underwood & Co.

Established 1870

1019 Hamilton St. - Philadelphia, Pa.



Lengthen the Life of Your Auto-Top!

There's one best substitute for a new cover—

"F-S" "Evernew" Auto-Top Dressing

Positively non-injurious; applied easily; dries quickly; makes the top water- and weather proof. Eight standard colors and special shades to order. Write for color-card and prices.

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Manufacturers of Colors, Paints, Varnishes.

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"Evernew" Auto-Top Sizing for first coat on mohair, cloth or canvas tops that have never been painted.

"Evernew" Auto-Body Enamel in colors to correspond with our "Evernew" Auto-top Dressing. Special shades to order.

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TIRES. TUBES. TIRES.

1912 STANDARD MAKES.

FREE SPECIAL OFFER FOR THIS MONTH ONLY.

\$3.00 Button Tire Cover given away with every purchase of tires. These tire covers are guaranteed water-proof and dust-proof and will be furnished in any size.

Highest grade stock, comprising of the best manufacturers. Cannot advertise names on account of the reduced prices we are selling them at.

Every tire is guaranteed brand new, perfect in every respect, and are not more than six months old. Some of these have the names of the makers on and others are buffed.

We thoroughly examine and test every tire and tube under heavy pressure to detect any weakness before shipping.

These are not the kind usually advertised. Nothing but the best stock is quoted in this ad.

Casings to fit Clinchers, Quick Detachable or Dunlop Straight Side Tires.

Size	Casing	Tube	Size	Casing	Tube
28x3	\$9.50	\$2.50	35x4	\$22.00	\$5.25
30x3	10.75	2.75	36x4	19.50	5.40
32x3	10.50	3.00	37x4	22.50	5.75
28x3½	12.00	3.00	32x4½	20.00	5.50
29x3½	14.50	3.15	33x4½	23.00	5.60
30x3½	14.50	3.75	34x4½	23.50	5.75
31x3½	15.00	3.75	35x4½	24.50	6.00
32x3½	15.00	3.90	36x4½	25.00	6.10
34x3½	15.75	4.15	37x4½	25.00	6.20
36x3½	15.00	4.25	34x5	20.00	6.00
30x4	16.50	4.60	35x5	25.50	6.25
31x4	17.00	4.75	36x5	26.00	6.50
32x4	17.50	4.90	37x5	28.00	6.75
33x4	19.00	5.00	37x5½	30.00	7.00
34x4	19.50	5.10			

Take advantage of these prices and free offer, as we cannot guarantee how long these prices will stand good.

We guarantee these tires and tubes to be strictly 1911 and 1912 goods.

We are one of the oldest and largest tire mail order houses in the United States, and you do not have to hesitate to send us an order with cash accompanied, as we can refer you to any Commercial Agency or Bank in New York, as to our references.

We agree to refund your money if goods are found unsatisfactory upon receipt.

We Ship Goods Subject to Examination.

INSIDE TIRE PROTECTORS.



Prevent blow-outs, punctures, and greatly increase mileage. These tire protectors are made from 3 to 6 ply of Egyptian fabric, with a self-seal flap reinforcing the rim and sides, always the weakest parts. Tube pinches are eliminated by the use of these protectors.

Order a complete set of them and save 100% on your tire expense.

Size	Reg. Price	Cut Price	Size	Reg. Price	Cut Price
28x2½	\$4.65	\$2.40	35x4	\$7.00	\$4.90
28x3	4.75	2.60	36x4	7.75	5.00
30x3	4.90	2.85	32x4½	7.25	5.00
30x3½	5.25	3.85	34x4½	7.50	5.10
32x3½	5.50	3.55	35x4½	7.60	5.25
34x3½	5.75	3.95	36x4½	8.00	5.50
30x4	6.20	3.75	34x5	8.10	5.60
31x4	6.25	4.00	35x5	8.25	5.75
32x4	6.40	4.20	36x5	8.50	6.00
33x4	6.60	4.40	37x5	9.00	6.50
34x4	6.75	4.75	37x5½	9.25	6.75

Owing to the fact that our profits are very small, we sell for cash only, and under no circumstances otherwise.

C. O. D. orders filled if 10% is accompanied with order, to show good faith.

Send for complete list.

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HESS-BRIGHT Ball Bearings

interchange with most other makes.

Write for the name of the nearest retail distributor.

**THE HESS-BRIGHT
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"The Brake Lining of Quality."



The Best for Brakes of all Sizes. Does not burn or glaze. Grips, holds, is durable and satisfactory, profitable and economical. Stands up under all conditions. The lining you need!

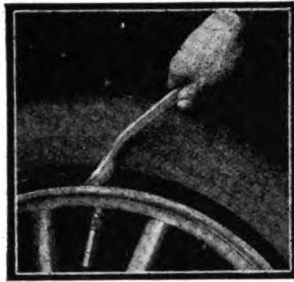
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Perfection Quick Detachable Rim Remover

It is simple in construction and acts so quickly that in thirty seconds the rim is released. Will remove the most stubborn rims with such perfect ease that any man, woman or child can operate it.

This appliance consists of a point and a recess between two flanges, and with one downward motion of rim remover the rim is released. Insert point as shown above. First half of downward motion forces the inside rim back and locks rim remover, and remaining downward motion releases outside rim.

Positively the most perfect device ever invented for the removal of Standard Universal Quick Detachable Rims. Made of steel and positively cannot break or bend.

Good Proposition to Jobbers and Dealers.

Write for Prices.

If your Dealer cannot supply you, order direct from us today, you may need one tomorrow.

Price One Dollar delivered by mail to any part of U. S. A.
\$1.00

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Manufacturers.

— Something New — Rex Velvet Nickel Polish

**MADE ESPECIALLY FOR
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NICKEL PLATED LAMPS
GERMAN SILVER REFLECTORS
AND ALL SILVER AND NICKEL
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For which articles no other polish is so good
Performs the twofold operation of polishing both the glass and nickel on wind shields, lamps, etc.
Soft as velvet.—Does not wear away the Nickel or German Silver more than a thousandth of the extent any polish for general use does.

Leaves the plating protected from corrosion

Fills a long unsatisfied demand

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REX STAPLES

**REX METAL CREAM POLISH,
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not only save your tires from the wear and tear of road contact, making new casings last indefinitely and giving renewed life to old casings, but they are superior mud and sand creepers. With your tires equipped with "UNIVERSAL" tire protectors you can go and come when you please regardless of road conditions and be certain of getting back safe and sound. No need for extra tires—no delays or annoyance and expense on account of tire trouble. The saving effected through the use of "UNIVERSAL" tire protectors

will ordinarily more than pay for your gasoline and the general running expense of your car from season to season. They fit any and all makes of tires, and are as easy to install or remove as quick detachable tires. Special offer to users in unoccupied territory.

Write us today for price lists and discounts.

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are made in three types, the Ratchet Anchor, as shown in cut, Armored

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All types made in 9 in., 12 in., 15 in. and 18 in.

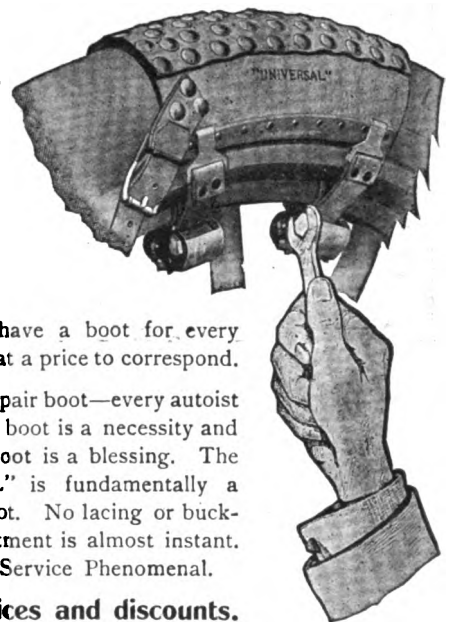
lengths. We have a boot for every emergency and at a price to correspond.

You need a repair boot—every autoist does. A repair boot is a necessity and a quick-repair boot is a blessing. The "UNIVERSAL" is fundamentally a quick-repair boot. No lacing or buckling. Its adjustment is almost instant. Cost Nominal. Service Phenomenal.

Write for prices and discounts.

Universal Tire Protector Co.

Lock Box, 678 D
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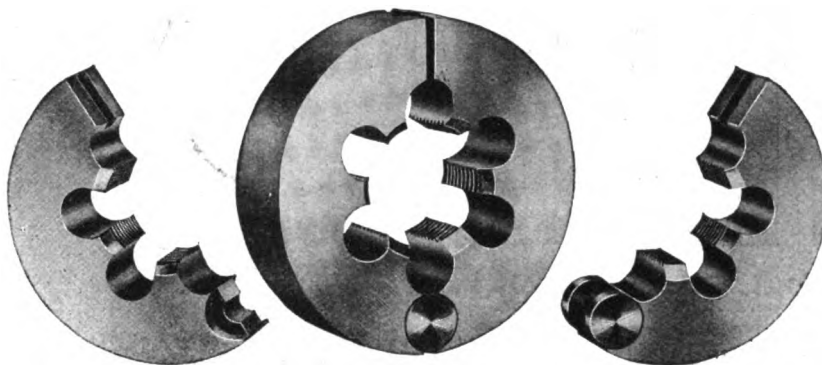


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The only Adjustable Die
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Truly Adjustable to Exact
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It can be Sharpened same
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It will Outwear at Least
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The Teeth are Keen and
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makes automobile chains both riveted and detachable—
all sizes in stock.



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We carry in stock sprockets for the following cars:
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Sprockets made to order.

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Automobile Garage Sets Prepaid



"Adamantine" Screw Plates

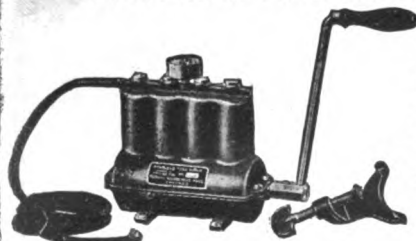
This Double Stocked Plate Cutting
Eleven Sizes, $\frac{1}{4}$ to 1", **\$18.75.**

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Send for Our Threading Tool Catalogue.

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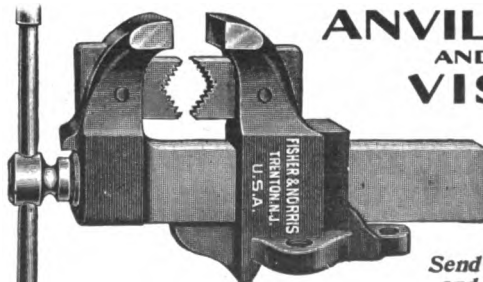


Built like a gasoline motor by expert designers of compressed air machinery. It is compact and powerful, and as the name implies, the peer of all pumps on the market to-day. If

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1843.

Send for circulars
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FISHER & NORRIS,
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New
Improved
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Increase Power
Save Gasoline

Speedo
IT'S GUARANTEED

It my dealer hasn't SPEEDO, I will order one direct.
Refunded if I am not pleased.
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YOU will never know how perfect your engine can run until you try SPEEDO. It is as essential as the carburetor. Thousands already in use. Attached in five minutes on intake manifold. Breaks up and remixes each particle of gas with sprays of new air, cutting crosswise



through the mixture. Automatically gives just the proper additional air your running speeds require. Passes you by the other fellow. Pulls you through sand and mud. Sails you over the hills. Small enough to be out of the way. Big enough to work wonders.

DEALERS—Be first to Sell. Send for Sample. Money Refunded.

Your money is refunded if you are not pleased. No dealer is authorized to sell otherwise.

See Any Dealer, or Write

Absolutely Guaranteed:

1. To Increase Power 20%.
2. To Save 20% Gasoline.
3. To Remedy Carbonization.
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Price \$3.50 Including Decarbonizer

"It's the SPRAY That Does It"

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Golden Star Auto Body Polish Keeps Your Car Well Groomed

It cleans, polishes and protects the finish.

Does not leave a greasy surface.

Easy and convenient to use.

A few drops of Golden Star Polish used on the dust cloth and your car looks bright, clean and new.

Free Sample

Let us prove (without cost to you) the merits of Golden Star, "The World's Best Cleaner and Polisher." Ask your dealer for a free sample or write us and it will be sent you at once.

DEALERS—Your customers will appreciate good service. Sell them Golden Star Polish. Ask your jobber—he can supply you.

R. W. MORRIS MFG. CO.
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TIRE CUTS

ruin casings. They admit moisture to the carcass, cause the fabric to rot and weaken, grow larger—end in blowouts. You can repair CASINGS and INNER TUBES anywhere in 15 minutes, better than a Repair Shop can do—and for one cent.



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PATENTED

A practical vulcanizing outfit complete, with enough repair gum to make 40 patches. It weighs 3 pounds and can be carried in the tool box.

Simplest And Most Satisfactory Device For Eliminating Tire Troubles That Has Ever Been Devised.

Absolutely automatic. Place the patch—attach the Vulcanizer—put in the gasoline—light it. No further attention required. In 15 minutes the job is done. It can't burn, scorch or injure tube or casing. It can't get out of order. It can't fail to do its work. So simple anyone can operate it. The Universal Auto-Vulcanizer saves its cost a hundred times over in trouble and expense.

Price Complete. \$4.00 Ready for Instant Use
Guaranteed Satisfactory or Money Refunded
If your dealer can't supply you, fill out the coupon below and mail to us. We will express it at once prepaid.

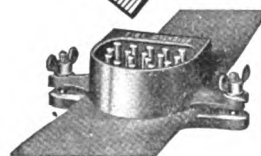
ADAMSON MANUFACTURING CO.

East Palestine, Ohio

Patented April 2, 1912
We will promptly protect our rights under this patent by the vigorous prosecution of all infringers thereof.

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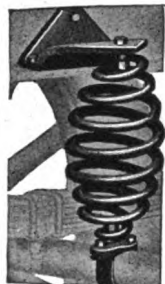
Have proven for seven years to be mechanically correct. Prevent recoil and bumping of springs; thereby reducing car maintenance to a minimum.

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Thousands of Dollars Saved Annually by Use of Sager Bumpers. Don't Wait for a "Smash-up" to Buy Protection. Do it Now.

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Used Almost Exclusively on High Grade Cars

Clamped on Bumpers of Distinction, Attached in Ten Minutes.

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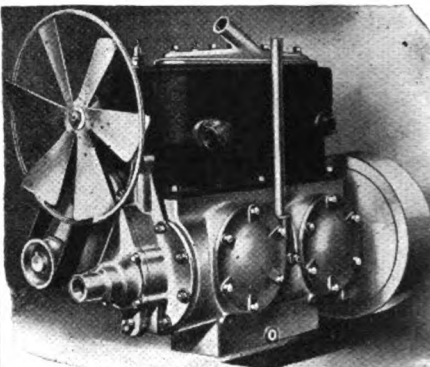


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Why use opposed motors when you can buy this four cylinder, silent, powerful and absolutely reliable motor for the same price?



16 H. P. 3 1/4 x 4 in. En. Bloc. Four Cylinder. THREE MAIN BEARINGS.

Write to us for Motors of any size, Unit Plants and General Equipment.

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SMOOTH TREAD
or NON-SKID Tires

REDUCE TIRE AND CAR UPKEEP



GRAY CUT-OUT

Cut Notch in Pipe and Clamp over it.

There's Nothing Better.

Price, \$1.50 to \$2.50.

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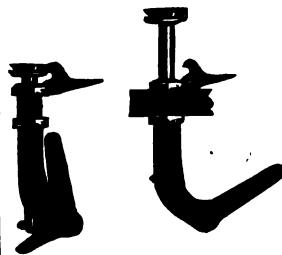
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It describes our complete line of Gray Mufflers, Autochimes, Autalarms, Filters, Pedals, Valves, Motor Boat Fittings, etc.

GRAY-HAWLEY MFG. CO.

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PATENTED FEB. 27, 1912.



Badger Running Board Tire Holder

The United States Patent Office has also allowed us the patent on our Rear End Holder, giving us the exclusive field for these types of holders. All persons are cautioned against using or selling infringed Badger Tire Holders, as there is a liability.

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The
New



ELECTRIC HEAD LIGHT OUTFIT

\$35.00

Complete Electric Headlights FOR FORD CARS \$15.00

With Fly-Wheel Magneto

Choice of Either Straight Body or Bullet Shaped Lamps



The successor to the gas tank. Current direct from Magneto.

The K-W Outfits manufactured for this purpose are not makeshifts, but are complete in every detail.

The Outfit Complete, which is all you need, consists of

- 1 pair complete Head Lamps.
- 2 Tungsten bulbs, 2-1/16" in diameter.
- 12 feet wire, all soldered to lamps.
- 1 Lighting Switch.
- Instruction Sheet for Wiring.

The Lamps are made entirely of one piece of brass drawn from steel dies; have no soldered joints, easy to polish, and make a handsome lamp for the Ford cars. They fit the forks furnished on the Ford cars.

SPECIAL OUTFIT DE LUXE

For those who want something "extra swell" or "classy" for the touring car, we can furnish, if desired, a 9" bullet shaped lamp which also fits the prop furnished on Ford cars. Price \$17.00.

The regular 8" lamp is, however, as large as required to catch all of the rays and throw all of them forward, and a larger lamp than this is merely for looks. For black finishing add \$1.00 to price of either outfit.

The K-W High-Tension Magneto

For all cars having provision for Magneto

Model J
Guaranteed
to start
auto
Engines up
to 30 H. P.



No Coil
No Timer
No
Batteries
4 Cyl., \$50
6 Cyl., \$55

We make larger Magneto for larger engines. High Tension Magneto are for Ignition use only. Use Low Tension for lights. If you cannot gear-drive a High-Tension Magneto, use one of our Low Tension belt or friction-drive Magneto and a K-W Spark Coil.

Complete Outfit; magneto, headlamps, switch, wire and bulbs.

Easy to install on any car with exposed fly-wheel.

No storage battery required.

No complicated cut-out nor charging device.

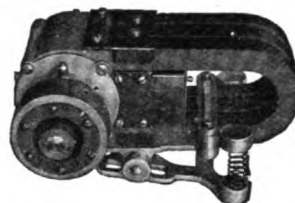
CURRENT DIRECT FROM MAGNETO.

Weight only 18 lbs. Compare this with the heavy, complicated and costly charging outfits

MORE LIGHT AND BETTER LIGHT.

Let us describe it fully.

The Lighting Special Magneto



The New Model LS Magneto, \$20.00. Complete Lamps, \$15.00

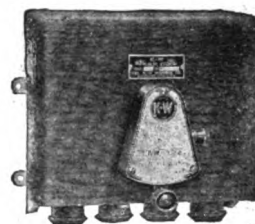
The Model LS K-W Magneto has one magnet less than our regular Model UL \$35.00 Magneto, and is just like it in every way except that the Model LS is slightly smaller. Model LS will light two 2 1/4-Ampere bulbs (two sixteen candle power bulbs).

This Magneto embodies the well-known K-W construction, having no commutator, no brushes, and no sliding contacts, the only moving part being the motor, which swings perfectly free, supported on high duty ball bearings.

FOR IGNITION.—This Magneto can be used in place of batteries for ignition if you have timer and spark coil.

The K-W Spark Coil

Single Cylinder	.....	\$12.00
2-Cylinder	.....	18.00
4-Cylinder	.....	30.00
6-Cylinder	.....	42.00
Marine Coils	.....	\$6.00 and \$7.10



26,000 FORD OWNERS NOW USE

The K-W MASTER VIBRATOR—Why?

Because the Master Vibrator does a great deal more than simply replace the four separate vibrators on a coil.

It is NOT A VIBRATOR in the ordinary sense but a scientifically constructed MAGNETIC CIRCUIT BREAKER which times the spark more accurately than the ordinary High Tension Magneto.

It is so designed as to utilize the alternating current of the Ford Magneto and make the coil produce a MUCH HOTTER SPARK than it could produce with any other vibrator.

No matter what coil you now have, whether it has four vibrators or one, THE K-W MASTER VIBRATOR will give you:—


A HOTTER SPARK, preventing sooty plugs and carbonizing. LARGER CONTACT POINTS and handsome switch.

EASY STARTING, due to the hotter spark. INCREASED SATISFACTION with your car.

MORE POWER. It makes the hills "Fade Away." EASILY PUT ON IN HALF AN HOUR, no changes in car necessary.

OUR GUARANTEE.—If you ever feel that you can get along without it, return it within 30 days,—money back and no questions asked.

PRICE, \$15.00. Express prepaid if cash accompanies the order. Order from us or through your dealer.

Be sure to get 

We are the originators and were the first to make and market a Master Vibrator. Insist on seeing the trade-mark and be protected in the original and only genuine time-tested and guaranteed Master Vibrator.

We make a complete line of ignition apparatus. Don't simply ask for Catalogue—Tell us your troubles and we will help you.

THE K-W IGNITION CO.
2817 CHESTER AVE. CLEVELAND, OHIO, U. S. A.

WE PAY THE EXPRESS East of the Mississippi River or to the Mississippi on points beyond on any of our goods, when cash accompanies the order.

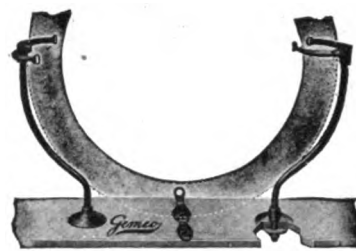


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Warns Without Offense
Dealers Everywhere
MANUFACTURED BY BOSTON, RANDALL-FAICHNEY CO. U. S. A.

"Gemco" Running Board Tire Holder

For all kinds of fore-door cars.

Neat,
Strong,
Easily
attached.
No
vibration.



Simple,
Practical,
No marred
body,
No side
sway.

Will accommodate either one or two tires, any size. Also supplied with Running Board Shoes if desired, at a slight additional cost. Write for complete catalog and discounts. Prices: Black, \$3.00; Brass, \$3.50; Nickel, \$4.00.

GARAGE EQUIPMENT MFG. CO.

Milwaukee, Wis.

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Exchange your old Magneto for a new Remy

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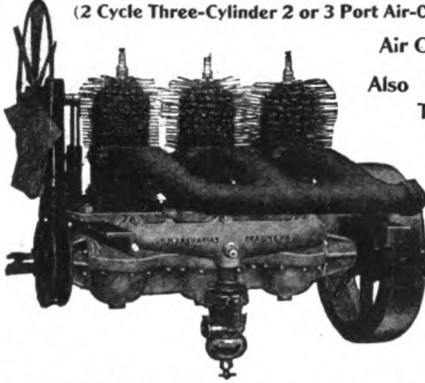
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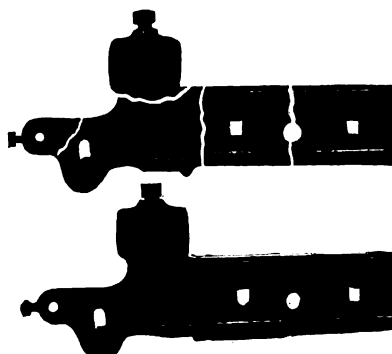
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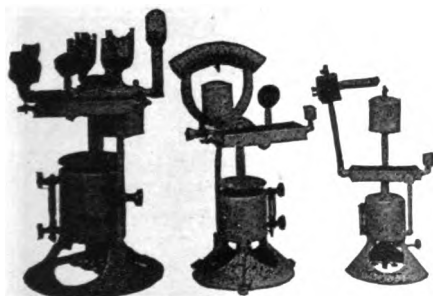
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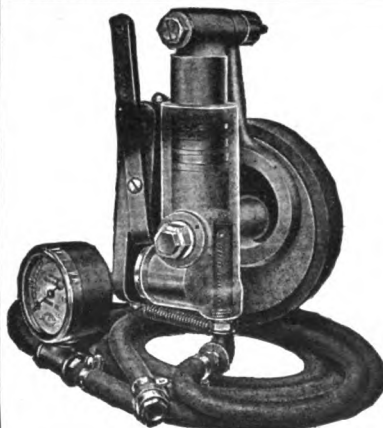
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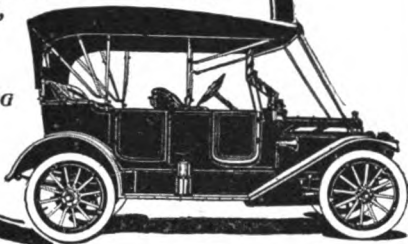


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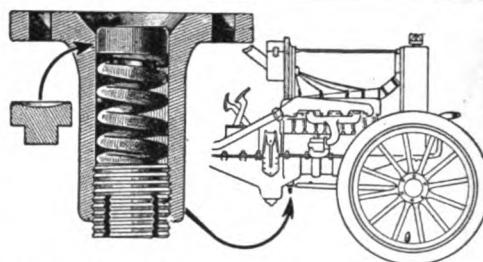
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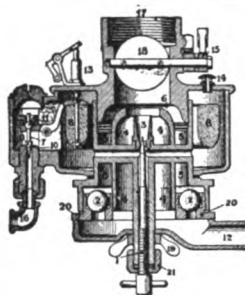
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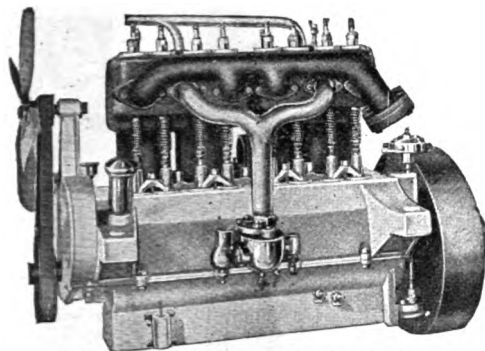
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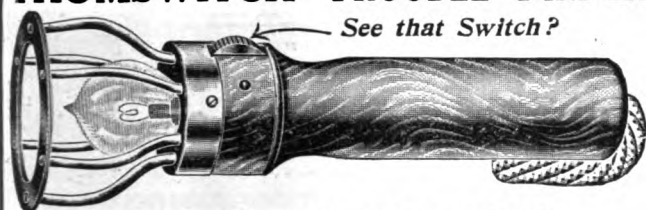
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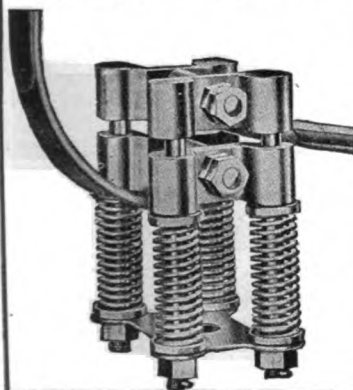
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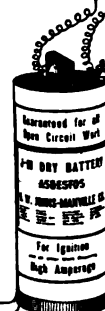
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EXACT SIZE
AND SHAPE

For nine years I have sold this cigar by mail, breaking even on initial orders and trusting to repeat orders for my profits.

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Will stop them all from leaking and make Mohair Pantasote or other tops like elastic leather. Almost unbelievable results can be accomplished by making old tops practically like new ones, at a small expense and little labor.



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Will remove mud, grease and dust, and spots of all kinds. When applied, the Rapid Auto Cleaner and Polish dries quickly, by rubbing the surface with a dry, soft cloth. It leaves the surface free from moisture, gum, grease, or soil of any sort which will stick to the hands or clothes. It can be applied to any surface without fear of damaging the same.

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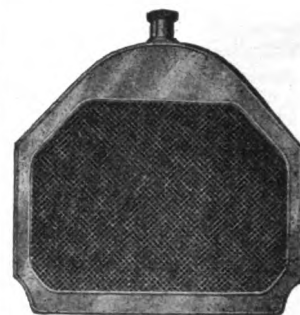
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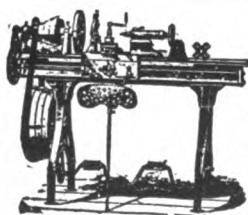
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by the repeated filling and emptying of the old style small grease gun, which is a tedious and dirty operation, or use a

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DELTA "RESERVOIR" GREASE PUMP

STORAGE CAN AND GREASE GUN COMBINED

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To introduce Sharp Spark Plugs to you and to convince you that their unusual construction makes them unusually effective, we want you to try them out in your car for two months *at our expense*. There are only two conditions to this offer—first, the accompanying information blank must be carefully filled out; second, at the end of two months you agree either to forward the purchase price of the plugs or return them to us.

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The Sharp Spark Plug Co.

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Name of Car.....

Year of Model.....

State License Number.....

No. of Cylinders.....

Plug now used

My dealer's name is.....

My name is

Address

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Mr. Automobilist!

Your tire maker is very anxious to impress upon you the importance of

TIRES INFLATED TO THE RIGHT PRESSURE.

He insists that this is tire economy and **SAVES YOU MONEY.**

How do you know what pressure you have in your tires?

A Schrader Universal

(Trade Mark Registered in U. S. Patent Office)



HALF SIZE.

(Patented March, 1898—Other Patents Pending)

Tire Pressure Gauge

will tell the exact pressure in your tires at any time, day or night, by simply holding this Gauge to your Valve for a second. Its recording sleeve remains in place, showing the exact pressure in the tire, so that the Gauge can be taken anywhere and read at night, to the front of the car into the light of the lamps. After the pressure has been ascertained the Indicating Sleeve can be pushed back into the Gauge with your finger. No catches or snaps to operate or get out of order. This Gauge is 2½ inches long over all, short enough to apply easily to the smallest diameter of wheel, and can easily be carried in the vest pocket or the change pocket of your trousers.

PRICE \$1.00 EACH, Ready for Delivery Now
GUARANTEED SIMPLE AND ABSOLUTELY ACCURATE

Can be obtained from all tire manufacturers and the dealers, or

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28-32 Rose Street, New York City



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WHAT THEY DO

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Your "Best" plugs are giving better service than anything we have ever used heretofore in our car. Plugs have never been out for any cause whatever.

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A JOURNAL OF PRACTICAL MOTORING.

VOL. XIV, No. 2.

NEW YORK, OCTOBER, 1912.

PRICE { 10c. PER COPY
\$1.00 PER YEAR

ELECTRIC VEHICLES CONTINUED.

Regulating the Speed of the Car Under the Different Methods. How They Operate.

No. 3.

BY SYDNEY F. WALKER.

The two methods (1), keeping the connections of the motor constant, and varying the connections of the accumulator, with the aid of a resistance; and (2) keeping the connections of the accumulator constant, and varying the connections of the field magnets of the motor, with the aid of resistance, act in different ways.

(1)—Where the connections of the field magnets of the motor are kept constant, the variation of speed of the motor is produced entirely by varying the pressure delivered at its terminals. Varying the pressure at its terminals varies the current passing through both the field coils and the armature; the same cur-

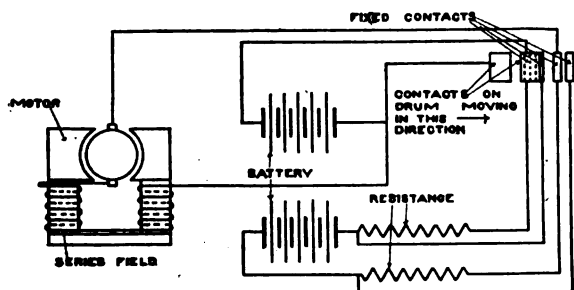


Fig. 3.—Diagram of connections for driving electric vehicle by accumulator, with accumulator in two parallels and resistance inserted between accumulator and motor.

rent passing through both. With a low pressure, such as that delivered when the car is starting, and when the accumulators are arranged in two parallels, the resistance interposed between the accumulators and the motor causes the small current that is necessary when starting, to pass through both the field magnet coils and the armature coils. This is shown diagrammatically in Fig. 3. As soon as the armature commences to revolve, as explained, it creates an opposing pressure, reducing the current passing through its coils; and then a portion, or all of the resistance is cut out of the circuit, the pressure at the terminal of the motor increasing in accordance with its requirements. It will be remembered from the explanation of the working of an electric motor, that the imposed pressure—the pressure delivered by the accumulator at the motor terminals—must always be in excess of that created by the revolving armature; and that the greater difference there is between the two pressures, the greater is the current passing through the motor coils, and the greater power the motor is delivering for the pressure of the service. As the motor gets up speed, when the controller is put to the first stop, the power delivered to the wheels would be lessened unless the pressure delivered at its terminals was increased by cutting out the resistance by putting the

controller at the second stop. This is shown in diagram in Fig. 4. As the motor speed still further increases, the controller is moved to the third stop, and the accumulators are now placed in series, with the resistance interposed between them and the motor. The pressure delivered by them at the motor terminals is now the full pressure available from the ac-

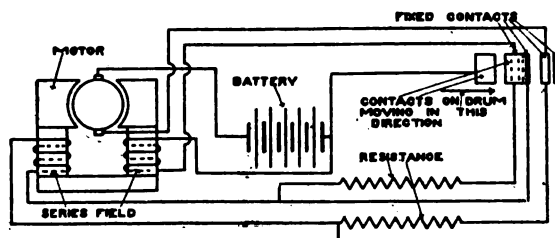


Fig. 4.—Diagram of connections with accumulator in two parallels and resistance cut out, controller on second stop, with this method.

cumulator cells, less that absorbed by the resistance. This is shown in Fig. 5, in diagram. Fig. 5 also shows the field magnets arranged to be connected in series or parallel. As the motor still further increases speed, a portion of the resistance may be cut out, or all of it may be cut out, according to the particular fancy of the inventor, or the constructor of the apparatus. If the resistance is cut out twice, there are five stops, and if only once, there are four stops. Fig. 6 shows the arrangement where all the resistance is cut out at once. The variations that can be made by varying the method of adding or cutting out resistance are wide.

A further arrangement that could be made, where the connections of the accumulator are varied, but which does not appear to have been brought into service, is by shunting the field coils of the motor, after all the resistance has been cut out between the

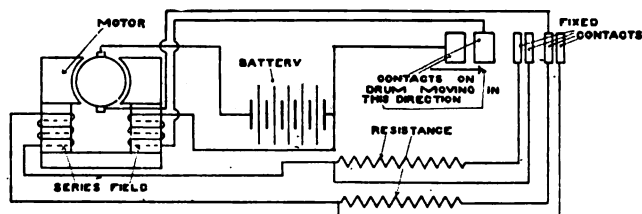


Fig. 5.—Diagram showing arrangement of connections with accumulator cells in series, and a resistance in circuit. The diagram also shows the field magnets arranged to be connected either in series or parallel, but always with the resistance in circuit.

accumulator and the motor. This would cause the speed of the motor to still further increase; but the arrangement is more on the lines of that employed in the second method.

(2)—With the method of varying the speed by varying the connections of the electro magnets, another property of the electric motor is made use of. It is really an extension of the property already described, by which the working current depends upon the difference between the impressed and reverse pressures. In any electric motor, if the current passing

round the field coils is reduced in any way, and there are several ways of accomplishing it, the armature runs faster. A little consideration will show that this is a necessary consequence of the fact that the armature tries to create a back pressure as nearly equal to the impressed pressure as it can. The back pressure created by the armature depends directly upon the current passing through it, upon the speed at which it is revolving, and upon the strength of the

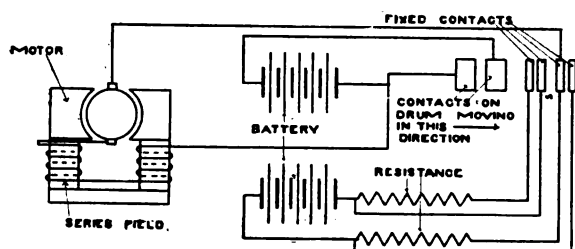


Fig. 6.—Same as Fig. 5, but with resistance cut out.

magnetic field. So long as these are constant, the back pressure is constant; but if one of them is lessened, the back pressure has to be made up by increasing one of the others. If the strength of the magnetic field in which the armature is revolving is lessened, as it is when the current passing in the field coils is lessened, the armature must run faster, and if it can it will take more current, in order to create the necessary back pressure, the back pressure responding to the load at the time.

With stationary electric drives, what is called the shunt wound motor is more commonly employed, in which the field magnets are energized by a shunt or loop from the main circuit, consisting of a large number of turns of comparatively thin wire, in which a small current is passing. Varying the speed of the motor with this arrangement is accomplished by in-

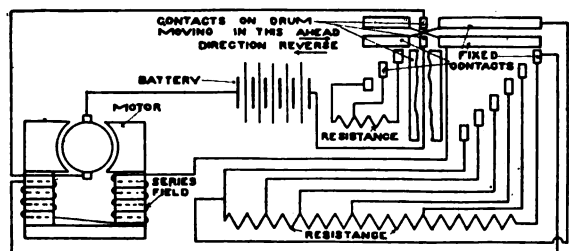


Fig. 7.—Diagram of connections with accumulator cells always connected in series, field magnets of motor in series, with a resistance in circuit. The diagram also shows how the resistance is cut out in steps, and how reversal of direction of motion is effected by means of the controller.

serting or withdrawing resistance in the shunt coil. So far the shunt wound motor has not been found suitable for car driving. The series wound motor has the great advantage that it furnishes the heavy torque required on starting from rest, and during the acceleration period. The strength of the field magnets with the series wound motor is reduced when the two magnets or the four magnets, as the case may be, are connected in parallel, instead of in series with the armature. When they are in series with the armature, the same current which passes through the armature passes through the field coils; when they are in parallel, the current passes through the armature divides between the field coils, so that they only get half the current, or a little more than half the strength which they get when the field is in series with the armature. Hence, when the field magnets are arranged in series, and a resistance is inserted between the motor and the accumulators, the low

pressure required for starting is delivered at the motor terminals, but the torque required on starting, and for accelerating, is obtained. Fig. 7 shows the connection for this.

Fig. 7 also shows how reversal may be done by the controller. As the armature again gets up speed, and as the back pressure created by it increases, the pressure delivered at the motor terminals is increased by cutting out the resistance. This is shown in Fig. 8. This may be done in one or two steps, as may be convenient. As the motor still further increases in speed, and as further speed of travel is required, the field magnets are connected in parallel, with a resistance interposed between them and the accumulators. This is shown in Fig. 9, in which also a separate switch for reversing is shown. The armature further increases its speed to meet the new conditions as explained above, and when further power is required to maintain the increased speed, the resistance between the motor and the accumulators is cut out, in either one or two steps, the full pressure of the accumulators being finally delivered at the motor terminals under conditions for high speed.

Fig. 10 shows this arrangement, and also a circuit

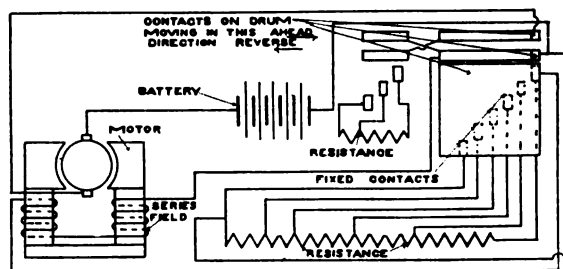


Fig. 8.—Same as Fig. 7, but with resistance cut out.

breaker for relieving the battery in case of an overload and a blow out magnet to extinguish the spark. Again the speed is further sometimes controlled by shunting the field magnets, by means of a resistance bridged across them, which is connected when a high speed is required, with a comparatively small load. Figs. 10A and 10B show this arrangement. In Fig. 10A the field magnets are in series, and there is a resistance shunted across them, and in Fig. 10B they are in parallel with a resistance shunted across them.

The Question of Starting from Rest.

With the electric motor, the question of starting from rest is also an important one, and has to be

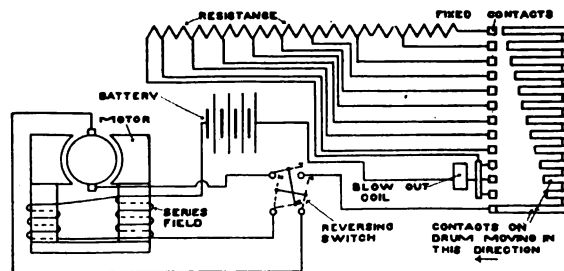


Fig. 9.—Diagram showing connections where the accumulator cells are in series, the field magnets in parallel, with a resistance in the circuit. A separate switch for reversing is shown.

dealt with in a special manner. It will be remembered that when any machine starts from rest, first the inertia has to be overcome, and consequently a powerful effort has to be made by the motor that is employed; and following upon this powerful effort, a still heavier demand is usually made upon the motor, during what is called the period of acceleration. The

period of acceleration is the time during which the vehicle is getting up speed. We are all of us familiar with the jerk with which a vehicle often starts from rest, and we all know also that it does not get up its normal running speed for several seconds. It is during this period that a heavy demand is made upon the motor furnishing the power. It has led to all sorts of devices for furnishing the temporary increased power demanded, in the gasoline motor. In the electric motor the problem is part of one peculiar to the motor itself.

It was mentioned above that when the motor is running, it creates an opposing pressure, which tends to cut off the current that would otherwise pass through the motor coils and that the actual current passing depends upon the difference between the supply pressure, and the back pressure of the motor. When the motor is at rest, it is creating no back

pressure; and therefore if the full pressure of the supply was allowed to be delivered to the motor coils, a very powerful current indeed would pass through them, which would generate sufficient heat to destroy the insulation, and there would be the peculiar result, a result peculiar to the electric motor alone, that the motor could not start from rest at all. A few figures taken from the hypothetical case mentioned above will perhaps make this clearer. Taking the supply pressure at 80 volts, and the resistance of the motor as 1, and remembering that current passing through any circuit in which there is no opposing pressure, depends directly upon the pressure delivered to the circuit, and inversely upon the resistance, it will be seen that the current which would pass through the motor coils, would pass through the motor coils, would be 800 amperes. Bearing in mind also that the heating effect of the current depends upon the square of the current strength, it will be seen that approximately the heat delivered by the current which would pass into the coils, would be somewhere about 250 times the normal heat created by the regular working current. The matter could be carried farther, and the actual heat delivered to the wires calculated.

them to a temperature at which the insulating material would be quite destroyed. In fact many motors have been wrecked owing to the starting switch that is always provided for use with electric motors, inadvertently having been left disconnected. In works for instance, it occasionally happens that the pressure of supply fails, the motor stops, but is left connected to the supply service, without the intervention of the starting switch. Perhaps a little later the supply service becomes normal, and the powerful heating current mentioned above passes through the coils, with the result that the motor has to go to the repair shop. In addition to wrecking the insulation of the coils of the motor, as mentioned above, the motor itself could not start, if the power current mentioned passed through its coils for another reason. The field magnet coils, and the field magnets generally, create the magnetic field within the cylindrical space in which

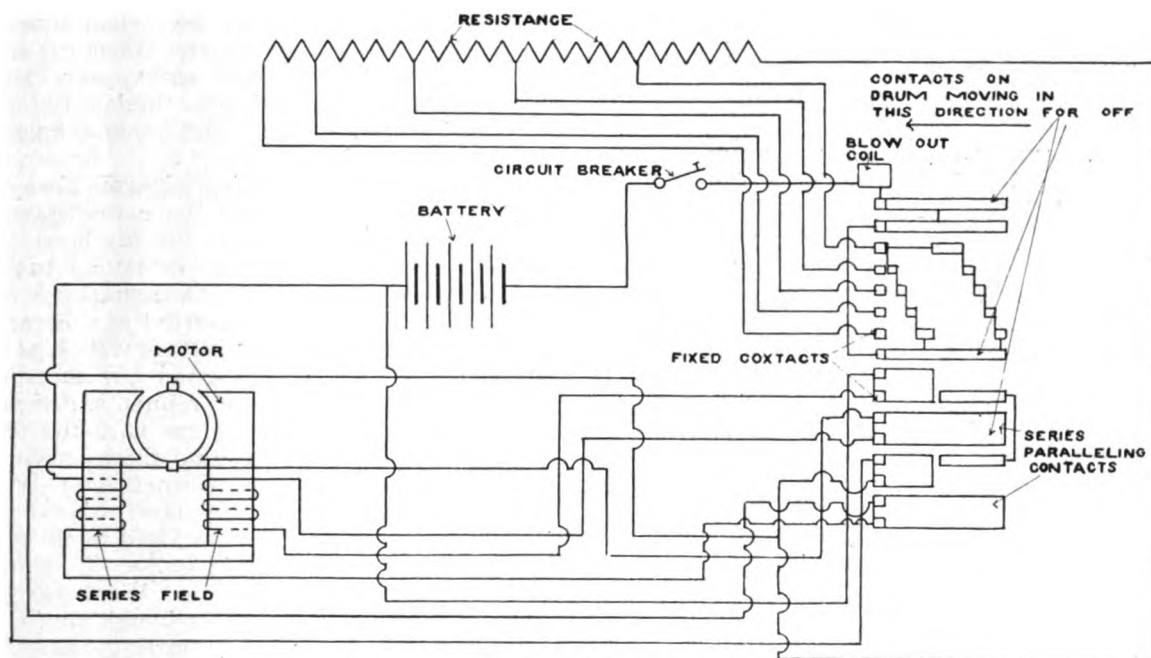


Fig. 10.—Diagram of connections, with accumulators in series, field magnets in parallel and resistance cut out. A circuit breaker to relieve the battery in case of overload, and a blowout magnet to extinguish the spark on breaking circuit are also shown.

pressure; and therefore if the full pressure of the supply was allowed to be delivered to the motor coils, a very powerful current indeed would pass through them, which would generate sufficient heat to destroy the insulation, and there would be the peculiar result, a result peculiar to the electric motor alone, that the motor could not start from rest at all. A few figures taken from the hypothetical case mentioned above will perhaps make this clearer. Taking the supply pressure at 80 volts, and the resistance of the motor as 1, and remembering that current passing through any circuit in which there is no opposing pressure, depends directly upon the pressure delivered to the circuit, and inversely upon the resistance, it will be seen that the current which would pass through the motor coils, would pass through the motor coils, would be 800 amperes. Bearing in mind also that the heating effect of the current depends upon the square of the current strength, it will be seen that approximately the heat delivered by the current which would pass into the coils, would be somewhere about 250 times the normal heat created by the regular working current. The matter could be carried farther, and the actual heat delivered to the wires calculated.

It will be sufficient here to say, that it would raise

the armature is revolving; but the current in the armature coils themselves also creates a magnetic field, which opposes that of the field magnet coils; the actual working field being the resultant of the two fields, that created by the field magnet coils and that created by the armature coils. In designing dynamos, it is carefully arranged that the field created by the armature coils is comparatively small compared with that created by the field coils, and so the machine works. If, however, the machine is started from rest, without the intervention of some apparatus to reduce the pressure, and the powerful current mentioned passes through the armature coils, the field created by the armature coils is sufficient to overpower that created by the field coils. Consequently there is no field for the armature to revolve in, and consequently it can perform no work.

With the ordinary motor working in factories, say, where it is fixed, and driving some fixed machine, the difficulty is overcome by the use of what are called starting resistances. When the motor is being started, the full pressure of the supply service is not allowed to be delivered to the motor terminals; but it is reduced by the interposition of a graduated resistance. The resistance is calculated so as to leave only a small

pressure at the motor terminals when starting, and as the motor gets up speed, and commences to generate the back pressure referred to, the resistance is gradually cut out, section after section being switched

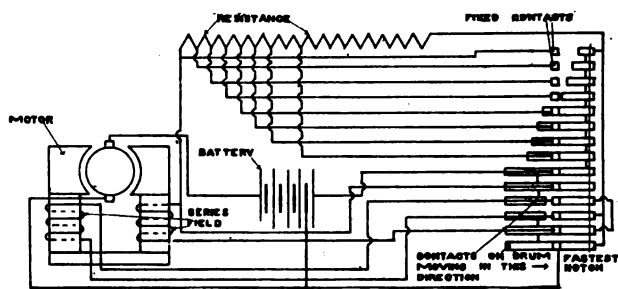


Fig. 10A.—Diagram of connections with battery in series, field magnets in series, with shunt resistance across field magnets.

off, as the speed of the motor increases, till when the motor is running at its normal speed, the whole of the resistance is cut out, and the full pressure of the service is delivered to the motor terminals.

In electrical vehicle work, the starting resistance

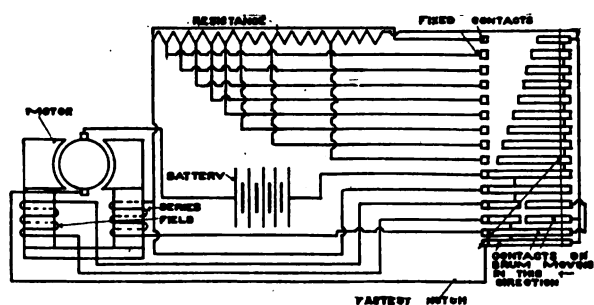


Fig. 10B.—Same as Fig. 9, but fields in parallel with shunt across their terminals.

would be somewhat out of place; and its place has been taken by the arrangement referred to.

HIS FIRST AUTOMOBILE.

Philosophical Ruminations Concerning Experience With a Car of the Vintage of 1902.

From W. L. R., New Jersey.—The old Darracq car has been run by me for the last time and there is a new car in my garage, a real four-cylinder automobile which will permit my mind to wander sometimes while I run it and not demand the constant attention the old car did.

The old car was a single cylinder 1902, 9 h.p. French rating, runabout style, but capable of carrying three on its one broad seat. It had three speeds forward and reverse which sometimes worked but usually would not. On a good level road it could go, in damp weather, about twenty-five miles an hour. It climbed most hills in second gear, provided the engine kept running. If it reversed out of the garage, I was satisfied to go around the block next time rather than try to back up. Often I pushed it out of the garage, especially the first summer.

The timer was an open work affair—very much open I found—in muddy weather. It consisted of a corset spring with some platinum points and an eccentric affair which was supposed to make it "time." After getting stalled on several hills, I changed it for a Gurnet timer and then had no more trouble in that direction.

Let me suggest right now, although it may have

already been surmised, that my mind is non-mechanical. I do this because I am about to attempt some description. The carburetor was a tin can inside of a metal box; maybe it was a copper can but you get the idea. Then there was a foot pedal which opened a collar on the lower end of the inlet pipe and which I was told, regulated my mixture. I think it must have been very efficient because it took me full six months to learn how to do the regulating. Also, the car had an automatic inlet valve on top of the cylinder. Automatic inlet valves are no good. In the valve stem was a pin which wore out more times than I care to recall, stopping the engine with loud noises preceding. I always knew when the pin was worn out, and that a cotter pin went five miles and a wire nail fifteen. Later, I made a steel pin. It took me half a day to fit it, and it outlasted the car. Circling the inlet valve and within its cage, was a shutter, admitting gas and controlled from the quadrant beneath the spark lever. My spark lever had three notches and the "gas" the same number. When the foot pedal, controlling air, throttle and spark, were all in harmony, the car went well, but as the last two had to be held in place by my first and middle fingers, there were often discords.

Certainly the car was noisy. Horses always viewed it with great suspicion and once one gave me the whole road. I seldom had to use my horn. My wife who rode with me almost every time I took the car out could seldom hear the few remarks I wished to make. When these were directed at the car, as they often were, it was perhaps just as well I had a noisy car. The foot brake was good but the emergency never would hold although I relined and tightened it. Stalled on a hill, I held the car with the foot brake while my wife put rocks behind the rear wheels.

This was before I got the Gurnet timer. After that, I never stalled. Before it, I hardly dared to take a bad hill if alone in the car lest I had to sit in it indefinitely, holding the foot brake on.

The Darracq had a history. What car has not? The story was an army officer bought it for his wife to run. Deluded man! The starting crank pulled up at full sixty pounds, and I never saw any man who could start it with compression tap closed. Once I saw a powerful fellow lift the front wheels clear of the floor in the effort.

The story continues that this deluded army officer could never run the car save in lowest gear and he sold it to a brother officer who could not run it in any gear. I have often wished I might compare notes with these gentlemen. The car after these owners needed repairs and a man whom we will call F., who repaired it, came to own it as well. From F. I bought it for \$175 in May, 1908. F. was a real mechanic and he added a piece of stove lid to the top of the piston, riveting it on. He did not mention this but I know it because one day while giving a timid lady her first auto ride, the rivets came out and the car paused, fortunately in front of my door. This obliged me to install a brand new piston, after which I got increased power from my engine.

I bought the car in Philadelphia. I stipulated Montclair, N. J., delivery. Jimmie ran it up and gave me my first lessons. Jimmie also was a real mechanic. I did not then know the muffler from the carburetor. Coming in I met Jimmie at Plainfield and rode with him. The reverse dropped out of the box but the reverse rod held it fast. We did not know this until we stopped at Elizabeth. I think it must have dragged

several miles over the stones. Later Jimmie made new threads with a file and put it back in the gear box. It gave me so much trouble, I often wished it had lost itself entirely.

Next day early Jimmie showed me how to start the engine and where to put spark and gear shift. I was much impressed at what he said would happen if I made a mistake and have never lost the habit of looking first before I start any car to see where these levers are. I was greatly elated when the engine responded to my first effort to start a car. I felt I was some driver or might be.

That day Jimmie drove a hundred miles, taking my friends out in relays of two. Later on, my wife suggested I run the car. I did not want to try, thinking I had learned enough for one day. She persisted and I tried, Jimmie beside me to help. All I did was steer and I decided that was a man's job. Once around the block was enough. The car had reversible steering of which more later, and the wheel turned very hard. I left the car, my knees feeling shaky. I wondered if the man would buy it back, for I decided I was not meant to run a car. I said nothing and my friends urged me to try again. That time it was all different. The steering mastered, I soon went to second and then high gear, of course stalling the engine several times. When I left the car the second time, I decided I would keep it and for what it taught me and the real fun I had, I never regretted my decision. Ever since running a car has been really an exhilaration. I care little to ride unless I drive now.

Shortly afterwards, having no garage then, I took the car to the Fells to show Charlie. He had owned a car and sold it. But he knew more than I did about cars. He looked at my tires and said they were not fit to go around the block, but as a matter of fact they went nearly a thousand miles. I gave Charlie a ride but he seemed nervous and I took him home again. I said the steering gear was reversible. That means, if you pulled the wheel too hard one way, a little elbow reversed itself and, presto, the car steered as a boat steers, right to go left and vice versa. It was a fool way to make a car. In washing the car, I unwittingly reversed the elbow. I did not know it and supposed all cars steered that way. I had not run the car enough with it right to realize the difference. Besides, my mind was busy enough keeping it going to notice the difference. I decided to take the car to Greenwood Lake for the summer and also that it needed "overhauling." I asked the garage man to run it back to Montclair, feeling just a little timid "in traffic." He came, started the engine and got in. He let the gear in and immediately we left the driveway and almost hit Charlie's house.

"What the —" said the man, "ails this car?" "Nothing," said I, "What ails you?" Again we started and this time almost hit the house on the other side. Then the man got out, looked the car over and said, "How do you turn this — wheel when you want to go to the right?"

"Left, of course," said I.

His remarks were simply unprintable and he told me I rode to Montclair with him in that car at my own risk. We rode and it became very funny indeed to see him steer. He asked me to run the car but I would not. We had three narrow escapes. Always he seemed to do the wrong thing at a critical time. Which I later came to know was only natural under the circumstances.

We had no collisions—only near ones. In my inno-

cence I asked the garage man not to let anyone run my car while I was away. "No danger," he assured me, "when I tell them how it steers."

Well, he fixed it but he never told me what was wrong with the steering gear. Later, I learned that myself. All it required, was to cramp the wheel the other way and back it came. But in my bill was an item for fixing steering gear.

In July I ran the car to Greenwood Lake with my friend S. We made good time and boiled the water slightly on hills. This lake has high mountains on each side. The road north, through the village, leads up a little hill. East and west are high mountains to Tuxedo and Warwick. I never cared to go to either of these places but I did wish to go to Monroe, ten miles north of the village and over that pesky little hill. One day S. ran the car up that hill but we had not enough time to go to Monroe. By this, I knew the car could climb it. The hill had a little knob on the top, really quite steep but I had made the car climb steeper hills going to the lake.

One day I wished to take my wife to Monroe but I could not get the car up the hill and we satisfied ourselves with riding around the village. There is not much to see in the village and only three roads. Seven times that day I tried to get the car up the hill and failed. At the knob, the engine would gasp and stop. When that happened my wife would get out and play the stone game after which I got out. Then I would turn the car around (by hand) and try again. This exercise was repeated each Wednesday and Saturday for several weeks with the usual ride around the village. Friends asked me why I always rode in the village. I told them because it was such a pretty place, which it is not. That hill with the knob on top became a nightmare to me. I told my wife if we ever climbed it we would go until we had no gas left, wherever that might be, and eventually we did, but that is another story.

One fine hot Saturday in mid July, being engaged in my usual efforts on the hill, the engine stopped and my wife got out. While she went for stones, I had a pair handy which we always used. I tried to hold the car with foot-brake and it would not hold. The car slid gently backwards at first, then gained speed. I had visions of an upset and decided to turn off the road, not being skillful in backing down. To the right in the direction I turned, was a rounded gutter, flanked by a stone wall. Low gear was in. I swung through the gutter and up against the stone wall, from which the car rebounded and the engine started. We lurched across the road, down the grade for a short distance and into a stone wall on the other side, but long before the car hit, I had deserted the ship. The engine then decided to stop and it took me an hour to dig the car out of the stone wall. No damage but a little paint off.

My wife said just before I jumped, two of the car wheels reared up off the ground at least a foot. I rather think they did.

I deferred operations and told Jimmie who was then at the lake. He offered to see what was wrong. He tried the same hill and the car to my secret delight, did the same thing as it had when I ran it. But Jimmie backed gracefully down hill and proceeded to look over the engine. He soon found the trouble. The cap on the inlet valve cage was cracked and the engine lost power. A bit of solder fixed that, and next time I tried the hill we went over it and ran until there was no more gas in the tank. I waited an hour before more

gas came by grocery wagon, but I did not care nor did my wife. The Darracq had broken prison bounds and no more need I ride in the village.

About this time the Darracq agency in New York reduced prices on all parts for old cars. I bought almost at random to the tune of several dollars, but very few indeed ever went on the car while I had it.

The car, however, refused to reverse. It would make a hideous noise and either stand still, engine going, or stall. This was often humiliating. Country blocks are long and very often I had to back by hand; in fact always did the first summer. One time doing this, I got the car off the road in a soft place and had to wait until help came to push it back. But we never were in a hurry and the scenery in this place is very fine. In the following fall, when back in Montclair, I made many efforts to fix the reverse and so did numerous garage men without success.

One day I took out all the transmission gears and put in a new reverse. Also screwed up a joint in the rod which cleaning had revealed to me for the first time. The car was temporarily in a friend's garage. When all was finished I let in the reverse without the slightest hope of going backwards. I shot out of the garage like a rocket, tore a large splinter from the door and stopped. I was delighted. My car had at last reversed. I tried it again, still fearful the trick would not repeat, and this time left the driveway and broke off a pet crabapple tree. Then I felt sure the car would reverse and it usually did, but with such an unearthly racket I seldom used it except to back out of my garage.

One winter day I asked two friends to ride. I had trouble in starting the engine and soon noticed it did not pull well. Also I observed a little stiffness when I first turned it over. After about a mile I saw steam coming from the radiator and stopped. My pump had frozen, not being arranged to drain with radiator, and no water had circulated.

The solder Jimmie had put on the inlet valve in the summer had melted off but thanks to my random purchases from the Darracq agency I had a complete new valve cage and put it in. This took us home.

Naturally I had blow outs and punctures. One hot day I repaired nine. Clincher shoes, 32x3½, too.

The early Darracq oiling system is simplicity personified. No force feed except by hand. Each half hour one pumps a lot into the crank case from plunger pump, connected with oil reservoir on dash. But if you forget to close the pump, the engine will surely suck the whole contents of the reservoir into the crank case and you crank fiercely and then stop. Three times I stopped for this cause. When a fellow runs a one lung Darracq as I describe, he does not always remember everything.

In the fall of 1909 I decided to put on a modern carbureter. Several friends advised it. Friends do not always know what is best. I had a Monarch. This installation cost me \$5.00 and it was the only money I ever wasted on the car. Also it caused the only breakdowns, obliging a tow. My explanation of the failure is that the automatic inlet on the engine and automatic inlet on the carbureter and the foot pedal air valve would not work in unison. I took off the Monarch and went back to the old carbureter very gladly.

About this time my engine developed a terrific knock and investigation showed connecting rod and rings and end bearings required renewal. They got it but I subsequently located knock in the water pipe which had been hitting the flywheel. I could take off

the cylinder, scrape it and put it back in an hour all alone. I did this several times. The differential was the only part I never investigated. Reason, it never troubled me and I let it alone.

I had no ignition troubles after putting on Gurnet timer. I used a well known 6-60 storage battery and recharged it each six weeks, regardless of how much the car was used. This is the secret of a storage battery. I had a third interest in a vulcanizer and used it, but the tire putty or dough is preferable for small work and large jobs are best done by a professional. Once I did cut down a 32x3½ tube to make it fit my 28x3 front shoes, but I cannot say the job lasted more than a few miles.

The Darracq went thirty-eight miles on a gallon (measured) of gas. Time and again I did it for doubting friends. But the saving in gas went for lubricating oil, which was literally consumed by the quart—three in eight hours running. I replaced the French size rims with American sizes, fore and aft.

The car raised a cloud of dust and much of it fell on the passengers' necks. After a few miles the back of my head felt same as the road itself. For \$10 I put on a second-hand top which relieved us from the dust somewhat when down. Practically my entire expense was on improvements. Very few repairs were due to breakage. I installed a muffler cut-out which was the wonder and admiration of all who saw it. And I did it with a flat piece of iron, a button-hook and a bit of wire. Only, I could hardly reach it from my seat, but it gave great amusement to my wife who could reach it from her's easily. This little thing surprised some six cylinder drivers when they heard of it on a one-lunger. Also it gave her something to do besides offering advice on operation. She always called for more gas when the engine labored when it was getting all the gas possible. Opening the muffler often answered the same purpose to a certain extent.

Once on the Pompton Pike I was actually chased a mile by a motor cop. I was doing twenty-five and heard his chug-chug behind. I was going my limit of course and fortunately as he passed me on a hill, the car slowed down on its own accord. Even then I did not know him for an officer until as I passed he hailed me. I stopped and had a warning—also the information that I was a minute within the limit.

The hill saved me but I told my wife a little fine would have helped sell the car when the time arrived. We had begun to think of a new car.

My very last experiment was replacing the old exhaust valve with a new one. I ground the seat and put in the new valve. I started the engine and ran it, possibly, five minutes. Then I switched off the current and to my amazement the engine kept merrily on. At first I was amused but soon found to stop the car I had to shut off the gas at the tank. I tried again, suspecting a short circuit, but nothing short of no gas would stop that engine. I disconnected both battery wires and the engine still ran. For a moment I thought I was the discoverer of a new principle. I ran the car home, some eighteen miles, starting with battery in and then disconnected both wires. I must confess it was sluggish.

To shorten the story, after three garage men had advised and experimented, I decided the new exhaust valve was at fault and put the old one on. The car then stopped on the switch as a reputable car should do. Very likely the new exhaust stem was a trifle too long and the hot gas retained, exploded the new charge.

I learned a lot from the old Darracq, much that is

not in any book. It gave me many, many pleasant moments, not all of which were on the road. In fact, I really think for every hour I rode, I worked three in the garage. But I had an old car and expected it. With one exception, each time it went out, it came back under its own power. And it went out each time I wished it to except once. Which is saying a great deal. Among other things I learned how skipping the clutch ever so little would sneak the car up a gentle hill on high. And I did it almost three years without wearing out the leather. This is contrary to the books. I knew why the gears rattled and banged and banged, why the rear wheels wobbled, where the loose joints were. Some of these I bushed up with strips of tin and they did very well. I put running boards on the car myself with a little help, a new water tank, and bought three new shoes. I bought about \$25 worth of extra parts.

With all this and excluding oil and gas the car cost me on an average between \$6 and \$7 per month while I owned it.

In October, 1911, I sold it for \$50, as it stood; no guarantee it would go an inch or not fall apart within the mile. The purchaser wanted it in Williamantic, Conn., and asked whether to send it by freight car or boat. I suggested he run it (with help) under its own power, and it made the trip, some hundred and fifty miles without a breakdown.

In the summer of 1911, having a new car and not wishing to see the Darracq stand idle, I loaned it to a friend who I think took up every loose place on it and put it in far better condition than it ever was when I had it.

I have not seen the man who bought it or heard directly from him since. But I know the car reached its destination.

I was truly sorry to see it go for it had given me much fun. Once while running my new four cylinder a friend asked me if I ever wished for the Darracq. To his surprise I said I would like to run it once more. This was before I sold it, and shortly afterwards had the opportunity. I ran it around the block and had the most thrilling ride of my life. I had forgotten all I ever learned about its operation and was particularly troubled with the steering. Very much did the experience remind me of my first attempt in it. I then decided that I did not care to run the car I formerly knew so well.

But while less keen to run it, I confess to an interest in the old boat. Built in 1902, it is going yet, and if used right will go I think for a long time. I was often asked if I did not have trouble in getting parts for a foreign car, to which I replied that I had bought a fine lot of parts but needed none.

I would like to know how many miles that Darracq ran since it was built and how many more it will go before it reaches the junk heap, if it ever does. My new car was not a Darracq because the duty on foreign cars is very high. Possibly what I have is as good as a Darracq would have been but I do not know yet. The Darracq was my first car and I think one never forgets nor can forget the first car he owns.

It has my best wishes for a long life and a merry one.

Puncture repairing when on the road should be avoided when possible unless there is ample time to allow the cement to dry, as the cement will heat up and come off while driving if care be not taken.

SOMETHING ABOUT FUEL.

The Story of Gasoline and Alcohol—Beaten by a Bug!

BY JAMES F. HOBART, M. E.

So much misinformation is printed from time to time in the daily press and in some technical journals, regarding gasoline and alcohol for fuel purposes in internal combustion engines, that the writer desires to correct the natural but general misapprehension.

To properly tell the story of gasoline we must first look to its source, which in America is chiefly crude petroleum. This substance is distilled at various temperatures and the following table shows the products obtained from heating petroleum in a closed vessel and condensing the vapor which comes off.

By looking at the table, page 41, it will be noted that various substances are obtained from petroleum, some of them beginning to come over at 113 degrees. Some of these substances are very scarce and of little use for fuel as they are lost before the gasoline gets to the engine cylinder.

Next comes the true gasoline, driven over between 130

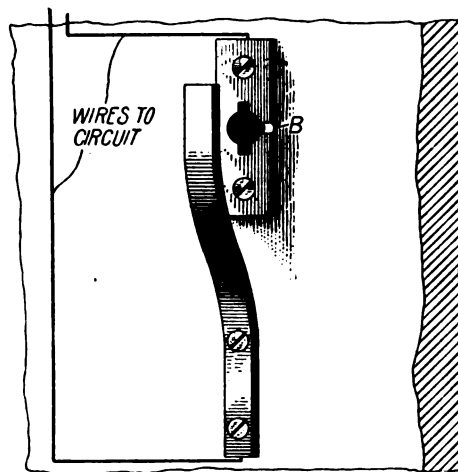


Fig. 1.

and 158 degrees. It will be noted that there is only one and one-half per cent. of gasoline in the whole petroleum outfit. Next comes what is known as "Naphtha C," and benzolene. There is ten per cent. of these three substances, taken together, and they come over at a temperature of 158 to 248 degrees. Then from 284 to 347 degrees comes Naphtha B and Naphtha A.

Next on the table you see polishing oil. It is of little use for polishing, for burning, or to lubricate. Finally it was made into medicine, and the public at one time was pretty well lubricated with it, but it was soon found that this substance was of no more value as medicine than as a lubricant. And the writer does not know what name it is marketed under at present.

Kerosene is the most plentiful substance in petroleum. In fact, 50 per cent. of the distillates is kerosene oil, hence the tendency to add as much of this grade to the gasoline as possible and make it work. Next comes residue and loss. The residue is capable, to a certain extent, of being broken up into other substances which may be of use in the arts. But they do not concern the automobile driver, therefore, we will trouble them no further.

Looking at the quantity or per cent. in the table, it will be noted that the entire output of benzine, petroleum and naphtha constitutes only 16 per cent. of the crude petroleum. It is therefore a comparatively scarce article. Really there is only one and one-half per cent. of

true gasoline in petroleum, but the benzine and naphtha are mixed with gasoline and serve to drive our automobiles, and here is where the automobile driver sometimes gets into trouble. When he gets hold of a mixture of benzine, naphtha and kerosene which will not evaporize at a low temperature he roundly condemns both the gasoline and "John D."

A glance at table below shows the boiling point of petroleum ether and all the others up to kerosene or "rock oil." The columns of specific gravity and density are also interesting to the automobile driver for it shows him what happens when the oil man gets shy of gasoline and mixes together petroleum ether and common lamp kerosene. He can bring the specific gravity and density down to the required standard, but when it comes to using the mixture in engines, there is a much different story told and the trail of smoke from the exhaust, helps tell it.

Gasoline is not a simple substance with a fixed boiling point, therefore we cannot make a theoretical calculation of the heat of its combustion, the air necessary and

alcohol of not less than 180 per cent. proof, there shall be added ten gallons of approved benzine. Alcohol is called 180 per cent. proof when it contains 90 per cent of alcohol and 10 per cent. of water by volume.

2—To every one hundred gallons of ethyl alcohol of not less than 180 per cent. proof shall be added two gallons of approved methyl alcohol and one half gallon of approved pyridin, which is a petroleum product. Methyl alcohol, benzine and pyridin used in denaturing, must conform to specifications of the Internal Revenue Department.

The heat of combustion of ethyl alcohol, 94 per cent. by volume, is about 11,800 B. T. U. per lb. This is a little more than one half that of gasoline; therefore if alcohol is used in an engine, it is necessary to consume twice as much of it as when gasoline is used for fuel. It may be possible to obtain a horse power for one hour with 0.7 pound of gasoline, but under the same conditions it would require 1.16 lbs. of alcohol to obtain the same amount of power.

The above shows one of the problems which autoists

CRUDE AMERICAN PETROLEUM.

DISTILLS AT DEGREES FAHR.	DISTILLATE	PER CENT	SPECIFIC GRAVITY	FLASH POINT
113 to 140	Rhigolene and Chymogene	Traces	.590 to .625	.....
140 to 158	Gasoline	1.5	.636 to .657	.....
158 to 248	Benzine, Naphtha C, Benzotene	10.	.680 to .700	14
248 to 377	Benzine, Naphtha B	2.5	.714 to .718	.....
	Benzine, Naphtha A	2.	.725 to .735	32
	Polishing Oils		.....	.....
338 and upwards	Kerosene Oil, Coat Oil, Petrol	50.	.802 to .820	100 to 122
482	Lubricating Oils	15.	.850 to .915	230
.....	Paraffin Wax	2.	.....	.....
.....	Residue and Loss	16.	.....	.....

From Robinson's Gas and Petroleum Engines.

the conditions for vaporizing or carbureting. It is true that naphtha, gasoline, kerosene, etc., are distilled at different temperatures, but there is not a good agreement between the character of these materials, their temperature of distillation, and their densities. The table given above, which shows these densities, may be good for one distilling plant but not for another. It is comparative, not absolute. But it will be a guide for the autoist who desires to study the fuel question a bit.

We have seen from the above, that gasoline, benzine, naphtha, etc., are all distilled from petroleum and we may add that they are all considerably mixed by the time the automobile driver gets hold of them. There is also trouble mixed with them and the autoist finds this, and finds it without looking for it. It would be a very good thing if someone would produce a strainer which would filter trouble from the gasoline before it gets into the automobile tank.

Having found what gasoline is made of, we will look at alcohol as a fuel. The autoist will be interested in understanding just what the process of denaturing alcohol may consist of. This may be understood as mixing ethyl alcohol with a substance whereby the alcohol is made unfit for beverage or medicinal purposes.

The methods of denaturing are briefly as follows:

1—To every one hundred gallons of ethyl or grain

are up against when they try to use alcohol instead of gasoline. Not only has the carburetor adjustment to be changed, but the supply pipes must perhaps be enlarged and necessarily other changes made. The same thing takes place to a lesser degree when a change is made from gasoline of high specific gravity to one of lower.

Thus a petroleum ether with gravity of .650 must be handled much differently from a naphtha A, which shows .722. The carburetor float will behave differently in each of these fluids and when necessary to meet all grades of gasoline and naphtha, the effect upon the float immersion must be looked after closely or the proper amount of fuel may not be carried into the cylinders. It surely requires "some carburetor" to handle all kinds of gasoline (naphtha to kerosene) during extremes of heat and cold, without adjustment.

Beaten by a Bug!

A few days since, while visiting a friend who runs a garage and repair shop, a call for help came in over the phone from a man whose machine had stalled suddenly, about half a mile from the garage. The driver of the machine could find nothing to cause the trouble, but requested that some dry cells be brought along as the trouble seemed to be with the ignition.

A mystery always appeals very strongly to the writer

—provided he can have a part in its solving, so went along to see the stranded car. Nothing whatever could be found to cause the trouble. The new cells would not work any better than those in the machine, and the only remaining thing seemed to be the testing of each inch of the wiring. The automobile was fitted with a vibrating coil, therefore that device was made the means

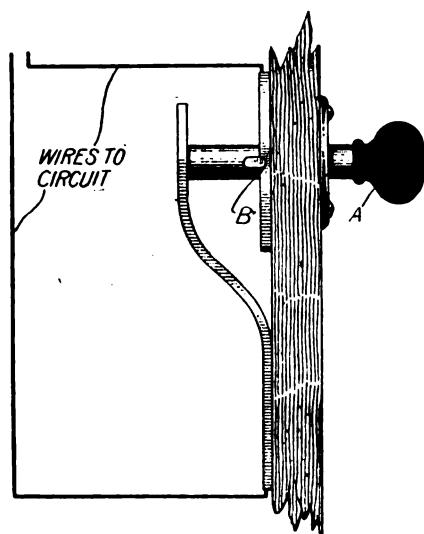


Fig. 2.

of testing out the circuit. Some lengths of wire were attached to the new dry cells and applied to the terminals of the spark coil, which at once responded, showing that there was no trouble in that part of the outfit.

Next, the wires were carried along the circuit so as to include the next section of wiring. This section extended to the timer and the coil would work through that wire, so it was judged O. K. and another section was tested. Pretty soon, a break was found. It was in the switch upon the dash. The car was rather an old model, 1907, and was wired different from present day methods, the switch being in the form of a plug which could be

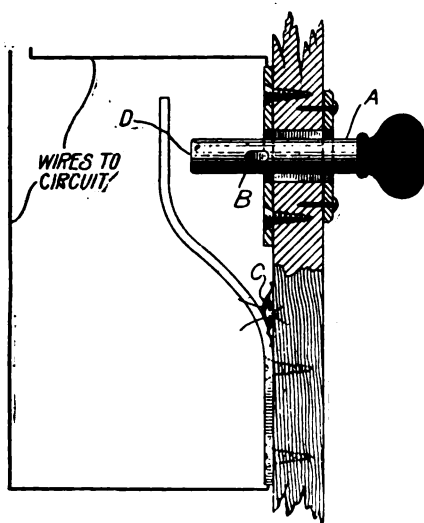


Fig. 3.

removed when the owner desired to leave the car. To turn on current, the plug was to be inserted, pressed home, and given a quarter turn and allowed to remain in that position.

The testing proceeded to the switch, but current stopped there, every time. Tests were made up to the switch, each way, and everything was correct, but try as he might, the garage man could get no current past that

switch. Finally, in working over the switch, the pin was given a push inward, by chance, and it was observed that the pin had end-play of a quarter of an inch or so, while in place. But, as the pin was pushed in, the current suddenly leaped through the spark coil, severely shocking the owner of the car who chanced to have both hands where they made good connections.

But as soon as pressure was released on the switch-pin, the circuit was dead as hay again. This was enough for the garage man and he immediately tackled that switch with screwdriver and pliers, and laid bare the cause of the trouble in a hurry. Fig. 1, shows the construction of the switch and the manner in which the current is cut off by removing the plug. Fig 2, shows the switch with the plug in position. The plug A, has been pushed through the hole in the dash, given a quarter turn, and the pin B, has settled into a groove made for it as shown by the same letter in Fig 1. This arrangement makes a pretty good and sure device, as long as it is working, which is not always. But it is not "bug-proof"! It

NAME	BOILING-POINT DEGREES F.	SPECIFIC GRAVITY	DENSITY DEGREES BEAUME
Petroleum Spirit	104-158	.650-.660	85-80
Gasoline	158-176	.660-.670	80-78
Naphtha C	176-212	.670-.707	78-68
Naphtha B	212-248	.707-.722	68-64
Naphtha A	248-302	.722-.757	64-60
Kerosene	302-522	.753-.864	56-32

Specific Gravity and Density.

will be noted that plug A, can be pushed in about a quarter of an inch farther, and this is what led to the undoing of that automobile.

Just a plain green bug C had got caught between spring and dash. As the pin was pushed in too far, the bug kept working down into the angle until finally the spring couldn't come back against the pin at D. Then, it was all off and the auto was out of business. The lesson is to watch everything, no matter how insignificant!

Vehicle Lights as Accident Preventives.

The bicycle craze of fifteen years ago demonstrated so clearly the value and necessity of lighted lamps on moving bicycles at night that the requirement of light by night was soon extended in cities and many boroughs to all other vehicles. Public hacks were required to have their lamps lighted at night long before this, but this ordinance was not then strictly enforced, but now in cities moving vehicles must be lighted at night, a precaution which is beneficial to both pedestrians and riders.

With the advent of the automobile there never was any question that it should be lighted at night. They are lighted brilliantly and dazzlingly, many of them, and they move in the city and country with a bright glow of light ahead of them. Other vehicles, outside of municipal limits, do not have to carry lights, and most of them move in darkness. This habit makes rural driving at night a dubious pleasure to all but the sharpest-eyed. Teams get almost on top of each other before either is aware of the other's proximity.

The driver of a team on a country road at night can see an automobile coming far ahead, but the driver of the automobile cannot see that the road ahead is occupied

until he is within a few yards of the team. It is no wonder that there are occasional collisions and always danger of disastrous catastrophes from this rural habit of traveling under cover of complete darkness.

In olden times it was the universal custom for those who used the highway at night to carry lights. It was not safe to travel any other way, and the same is true to-day. The highways are not safe in the absence of both wayside lights and lights on moving vehicles. It is impossible to tell whether the road ahead is free or unobstructed. The requirement of a lighted lamp was not oppressive to bicycle riders and will entail no hardship on the drivers of other vehicles. It will conduce to their own safety and peace of mind. They can then drive at night feeling reasonably assured when there is no light ahead that there is a free road in front.

COMPRESSION LOSSES.

How Lost Engine Efficiency is Often Caused by Piston Rings.

There is one cause of lost efficiency in an automobile that is not always fully realized. This is due to the piston rings. In the early days of motoring, very little importance was attached to piston rings, and it was con-

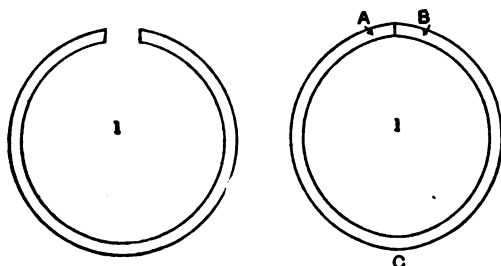


Fig. 1.—Showing a Concentric Ring Split and Closed.

sidered sufficient by some makers of engines to turn piston rings in the lathe, cut fairly large gaps in them, and leave the fitting for the engine to do in the course of running. The result was that not only did the engine badly over-heat, but the cylinders were oval in shape, owing to the uneven and excessive pressures that its walls were subjected to by the irregularity of the ring. Fortunately, manufacturers nowadays pay more attention to the design of piston rings. There are, however, many repairers who do not yet appreciate the need of accuracy in this direction, and for the benefit of those who contemplate having new rings fitted to their engines

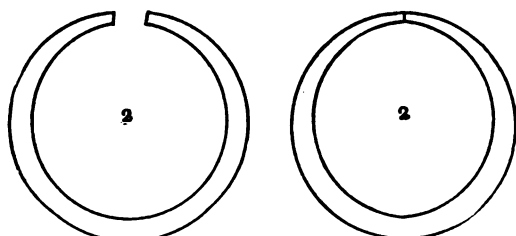


Fig. 2.—Showing an Eccentric Ring Split and Closed.

while the latter are being overhauled, some of the advantages and disadvantages of certain methods of manufacture are below pointed out.

It is a generally accepted idea that if a ring be turned concentric inside and out and then split, the outward pressure on the cylinder walls, when the ring is closed and in its place, will not radiate from the center. Now let us see exactly what this means. Looking at Fig. 1, we shall see that if the ring be closed and placed in the cylinder, it will be bearing on the walls on three points

only—A, B and C. A piston ring in such a condition is, of course, impracticable for use in an engine, so that the ring is made thicker in the first instance and then turned a true circle after being closed at the gap, thus giving a full bearing surface all round its circumference. Before doing this, however, it is the practice of some manufacturers to turn out the inner periphery of the ring eccentric to the outer, in order to equalize the pressures at all points of the ring, and although this does to some extent have the desired result, yet it is a far from perfect

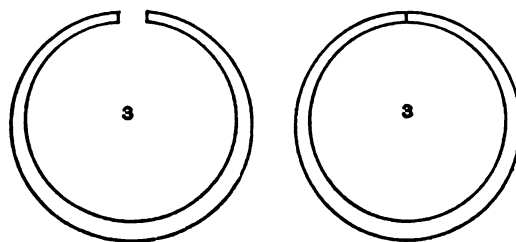


Fig. 3.—An Eccentric Ring Finished to True Circles Inside and Out, After the Ends Have Been Closed.

means to an end, and an inspection of Fig 2, will show that, although the pressures are far more even than with a concentric ring, yet imperfect pressures must result to some extent owing to the distorted shape of the inner periphery when the ring is closed. Although rings of this description may allow satisfactory running yet with very little more expense a ring more nearly perfect can be manufactured, and has been adopted by certain firms. That is, a ring turned to a perfectly true circle inside and out while the gap is closed, the outer circle being eccentric to the inner (Fig. 3). It will be seen that in this case, not only are the pressures more even on all

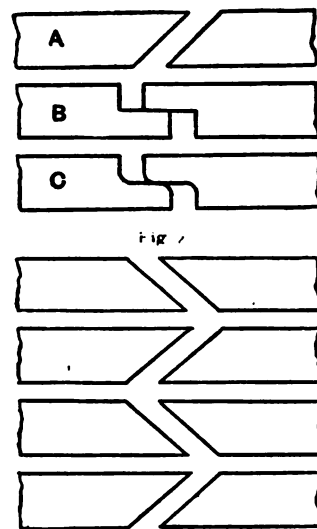


Fig. 4.

parts of the ring, but less pressure is required to make the rings gas tight, consequently there is less wear on the cylinder walls, more even wear and less heat is developed, resulting in higher engine efficiency.

Although a ring machined with a lathe tool can be very perfect if care be used in the turning, yet it is impossible to prevent particles of metal from breaking away from its edges and as its efficiency depends to a large extent upon the absolute truth of its upper edge it is advisable to grind up the ring with a fine grit carborundum wheel. An equally important point is the accuracy of the fit of the ring in the groove, and the practice of fitting rings into grooves that are too large for them and that allow of the slightest vertical slackness is strongly disparaged.

Turning now to the question of joining the ring, there

are various methods, some of which are shown in Fig. 4. Firstly, that of a diagonal cut across the face of the ring, a method which has been proved to be fairly satisfactory, although a point against it is the possibility of the gaps getting in line, thus allowing of an easy escape of gas on the compression stroke. There is a tendency for rings of this description to rotate in the opposite direction to that in which their lower diagonals point; it is worth while cutting every other ring in the opposite direction to its neighbor, as shown in the arrangement in Fig. 5.

Another method is to step the rings in the form shown in Fig. 4 (B), a method which may be much improved upon by leaving a radius of metal at the root of the step, as shown in Fig 4 (C), which will not reduce the strength of the ring at this point so much. Stepped rings should not be made less than a quarter of an inch wide on the face, and should on no account be fitted into an old and much worn or scored cylinder, as the steps will not stand abuse, and will break away. A stepped ring, if made correctly, will give very good results indeed, and is, if anything, slightly better than the plain diagonal cuts, for it has not the great defect of the latter type, which when circumferential wear has occurred provides an open and direct path for the escape of the gas on the compression stroke.

CARE OF BATTERIES.

Suggestions That Should Not Only Be Read But Committed to Memory.

The first necessity is cleanliness. There are exceptionally few cases to be observed where cleanliness is apparent. There is nothing that more easily provides and causes a leakage of the current, than accumulation of dust and many other kindred types of matter. When such are permitted to remain on the top of the cells they become saturated with the moisture which inadvertently sprays from the cell or cells while charging, and thus form an excellent bypass from positive to negative terminals, and in a very short time entirely empties the battery.

Again, this moisture is permitted to attack the terminals of the battery, and these being generally made of brass or similar metal are easily attacked and corroded so that they are immovable, and sometimes entirely enveloped by a heavy coating of blue crystals of sulphate of copper. This salt is readily soluble in water and acids, and if allowed to get into the electrolyte of the battery, is fatal to its life. Yet how often is this salt washed off with water, or removed by other methods, and allowed to fall into the cells? It is well to keep the terminals coated with vaseline or thick grease and so prevent corrosion. Just a few minutes, say once a week, will suffice to clean up a battery, and so comply with that first and most necessary rule.

Always keep the plates covered with their electrolyte, or acid, because if they are exposed or out of the liquid a sulphation occurs of such a nature as to damage the plates irreparably, besides which that exposed surfaces are inactive and useless.

Never add sulphuric acid to the cells to compensate loss, unless such loss has been caused by a spilling of the acid, and then first ascertain the specific gravity of the acid remaining in the cells and make up with diluted acid of the corresponding specific gravity till the plates are again covered. In all cases of adding to, or compensating, evaporation losses (except as above stated) nothing should be used but pure, dis-

tilled water, and absolutely pure and clean acid. A healthy battery used continuously, should not require any addition of acid more than once a week, if not less often.

Never, on any account, discharge your battery below 1.8 volts per cell, because it develops a condition of chemical natures that is not easily remedied.

The normal voltage of the storage battery is 2.0 per cell when doing work, which is, if the electrolyte be 1.250 specific gravity, usually raised to about 2.10 volts. The storage battery, unless worked below 1.80 volts, has a recuperative power of rising from 1.80 volts to the normal of 2.10 volts within a few minutes after the discharge current has been discontinued. Unless a current is passing of say one-half of one ampere, the voltmeter reading is useless.

Never adopt the method of putting a wire across the positive and negative terminals to see if there is any "spark." It is almost a dead short circuit, and if the cell be of a small capacity, of say, thirty ampere hours, and the wire No. 16 copper, the current passing may be anything from 30 to 100 amperes for a fraction of time, which, when calculated is a very appreciable amount of the total capacity. It is also very detrimental to the cell in assisting the disintegration of the plates or active material thereon.

Never allow the cells to stand in a discharge condition, as it becomes very difficult to get them properly charged if left standing any length of time, unless great care is taken during the succeeding charge.

Do not forget that the discharge current of the battery may be affected by the adjustment of the trembler of the sparking coil. The current rate of the discharge should be about one-half an ampere, but a badly adjusted coil may take as much as 3 or even more amperes, thus eating up the energy of the cells, in ampere hours, in one-sixth of the time. Thus a 30 ampere-hour cell discharging at one-half an ampere will last 60 hours, but discharging at 3 amperes will last only about 8 or 9 hours.

Although the storage battery is a more or less delicate apparatus, yet if only one-tenth of the attention given to the mechanical parts of the car be bestowed on the battery, it will be found a wonderfully robust and reliable apparatus. But if neglected entirely and left to attend to itself, or do the best it can for itself, it will be found to arrive very soon at a condition of disease generated by a congestion of small ailments.

Always adhere strictly to the maker's instructions which will apply to his type of cells.

New R-C-H Agents.

The following new agents have been appointed in their respective territories for the R-C-H car for 1913:

Frank Johnson, Coatesville, Ind.
L. S. Rudy, Sheyenne, N. D.
B. C. Barry, Santa Barbara, Cal.
O. C. Drew, Jr., Atlanta, Ga.
Edw. F. Cushion, Claremont, N. H.
H. E. Shaw, Greenfield, Mass.
Wm. V. Little, Miami, Fla.
E. W. K'Burg, Toledo, O.
Carmine Coccari, Menessen, Pa.
E. F. Walker, San Marcos, Tex.
J. W. Paulen, Fredonia, Kan.
Palmer Auto & Supply Co., Maquoketa, Ia.
Wm. Konow, Chicago Heights, Ill.
A. D. Barton, Cynthia, Ind.
Woodworth Bros., Newton Highlands, Mass.



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

984

Wiring for an Electric.

From P. G. Liederbach, Minnesota.—Please give me a wiring diagram for wiring a car for electricity from an Edison storage battery. If I use three switches, putting the front light on one switch wired in parallel and the side lights on one switch also wired in parallel, with the rear wired in series, will the speedometer light with such series wiring work and will both lights burn bright? What sized bulbs are about right?

Reply.—Your inquiry is rather clouded as you do not state the voltage of your battery. Each cell will show about 1.2 volts, and a 5-cell battery will therefore show 6 volts, which is the voltage ordinarily used for ignition purposes. We hardly see how you can wire the rear lamp in series, as it is impossible to wire in series unless you include one or more other lamps in the series. We advise that you use 6-volt lamps wiring each in parallel. Three switches may be used, but from one binding post of one switch you must run two wires, one to each headlight; from the binding post of another two wires should lead one to each side light, while from one binding post of the third switch a wire should lead to the rear lamp and another to the speedometer light. The three remaining binding posts of the three switches should then be connected together by the wire that leads to the battery, preferably the + or positive terminal, while the — or negative pole of the battery should be grounded on the metal frame of the car. Each lamp will then have to be grounded. You should interpose a fuse box between the switch and battery for the purpose of safety. If you desire to cut out either head or side light, or speedometer light, it will be but necessary to loosen the lamp or remove it and the other lamp controlled by the switch will burn if the switch is closed. In series winding if one lamp burns out the remaining ones of the series will not burn. If you put in two lamps in series they will have to be each one half the voltage of the current, and if three are included the voltage of each lamp must be one third. If you wire the speedometer light in series with the rear light, use one half the voltage for them that you do for head and side lights. An advantage of series wirings for these two lights is that the speedometer light acts as a tell-tale for the rear light. With proper reflectors, you can use 12 c. p. headlights, 2 c. p. side and tail lights and about 1 c. p. speedometer light. A fully charged 6-80 battery would last about 20 hours. Without headlights it should last 80 hours approximately. In series wiring there should be a wire leading from the switch to one lamp, then to the other, then to the frame of the car.

985

Priming for Cold Weather.

From G. E. Lawrence, Massachusetts.—Will some readers, also you yourself, give your experiences and opin-

ions, as to primers, or as they are sometimes called, starters, which prime from the dash or other convenient place. Also the make and model. The writer thinks he will need one on his Ford car as soon as the weather gets cold.

Reply.—With the advent of cold weather it has become practically advisable to "prime" automobile motors before starting. This is largely due to the heavy gasoline now being distributed. For this purpose individual priming cups or combined priming cups and spark plugs are largely used, also primers which are operated from the dash usually. This latter class of devices vaporizes the gasoline much better than ordinary priming cups and in addition injects pure air with the fuel. They are therefore more efficient. Several models are on the market, and are being advertised. We therefore respectfully refer you to our advertising pages. You will probably need some means for priming your Ford car if you are to operate it in cold weather.

986

Only "Pretty Good" Compression.

From Andrew Kipp, Michigan.—I have a model F Buick car which has given me a lot of trouble the past month. I have had three experts working on it but they have done no good. I can adjust the carburetor so the engine will run fine then when I go to use it the next day it will get balky. By readjusting again it will run good for a little while and then it gets another balky spell. What I cannot understand is why it will run good at one time and not another under the same conditions. I have looked over the carburetor, wiring and the magneto, and they seem to be all right. I have put new contact points in the magneto and they have good contact. The spark plugs are all right. It fires through the carburetor, which is a Schebler. I have cleaned out my gasoline tank and pipes. It will generally run better on the magneto than on the batteries. Sometimes, however, it will run good on either. The connections all seem good. My car is also slack in power but has pretty good compression. It has not run over three thousand five hundred miles and has always ran satisfactorily until this last month. I am simply up against it. If you can give me any information which you think will help me out I will appreciate it very much. Please answer by mail as I would like to get my car fixed as soon as I can.

Reply.—You have unconsciously explained the cause of most of your trouble when you say "has pretty good compression." Unless your motor has good compression do not look for any great amount of power. We advise that you carefully examine the fit of the pistons and rings in the cylinders, and the fit of the inlet valve stems in their guides, as loss of compression usually means leaks past either piston rings or valves, and "back firing" through the carburetor may be caused by too weak a mixture in turn the result of dilution of the mixture of gasoline vapor and air with air leaking into the inlet manifold or valve chests past the valve stems. You have a car that has been in use some time, and the carburetor a model D Schebler is now practically obsolete for motorcar use with the heavy gasoline of to-day. You undoubtedly need a more modern type of carburetor, an oil for lubrication that is considerably thicker than for a new motor and the motor must have good compression. This last condition may be obtained by new piston rings, or it may be necessary to get new cylinders, pistons and rings.

987

Lights for His Ford Car.

From Lee F. Johnston, Indiana.—I drive a 1912 model T Ford car and have been considering the matter of light.

Will you kindly advise me whether the electricity from the magneto is satisfactory or if it weakens the magneto? Also what power lamps to use and the matter of wiring?

Reply.—There is sufficient excess current from the magneto to operate two headlights, and very many Ford owners are lighting their cars from the magneto very successfully and without undue weakening of the magneto. Two methods of wiring are used, one with two 6-volt lamps in series and the other two 12-volt lamps in parallel. In the former the wire should run from the magneto binding post to a switch and thence to one lamp, then to the other and to the frame of the car making a good metallic connection. In this method if one lamp burns out the other will not light. In the parallel method of wiring the wire should branch after leaving the switch and the two branches should be connected to the lamps with the other lamp terminals "grounded" on the frame. The advantage of this method is that but one lamp may be operated at a time if desired, in case there should be too heavy a drag on the magneto, sufficient to interfere with ignition. We think that 8 c. p. Tungsten lamps will give sufficient illumination, although some owners of Ford cars use 12 c. p. The less the candle power quite naturally the less current will be used and the less current so used the less the liability of interfering with proper ignition.

988 **Probably Needs Replacements.**

From C. L. Trout, Iowa.—I have a model D a Maxwell car. Last year it was overhauled by the best automobile repairer I know of. I had the shaft and boxes on the rear axle put on new. Every time I drive five or ten miles since it gets real hot. I have taken it to a company in Des Moines and had it taken out and put in new again and it still heats. I have had it examined by the best mechanical men and not one of them can tell the trouble. The shaft seems to fit perfectly in every respect. If you can give me any information in regard to it I would be very thankful.

Reply.—The heating you describe is probably due to a "spring" differential housing, which allows the gears to run off their pitch line, bringing great stress on the opposite ends of the bevel gear teeth. It is barely possible that you need other new parts. Our advice is that you send the rear axle (without the wheels of course) together with the new drive shaft, direct to the factory at Tarrytown, N. Y., for necessary repairs and replacements.

989 **Easily Remedied.**

From C. Page, Illinois.—I have a 1912 Paige Detroit machine whose fan is soldered to the radiator and is continuously loosening. Do you know any way by which I can avoid this trouble? The fan is also a very noisy one. Do you think it would give less noise if bolted to the engine? If so, kindly instruct me as to how this may be done. The noise is not so noticeable until we reach a speed of about 20 miles.

Reply.—As all 1912 Paige-Detroits have the fan bearings mounted on a bracket attached to the motor, your car must be at least a 1911 model or possibly earlier. The New York distributors of these cars advise us that the factory at Detroit can furnish you with a bracket and full information concerning the change from radiator support to bracket support as above mentioned.

990 **Carburetor Adjustment Needed.**

From John W. Williams, Indiana.—I am having a little difficulty in advancing the spark on my model T

Ford machine. I can only advance it to about the 6th or 7th notch on the quadrant without a little knock and a loss in speed. I took my motor apart and cleaned all carbon deposit and ground the valves and had it as clean as a new motor but it does not change the matter. It runs with good power and smoothly at 15 or 20 miles an hour but I can not advance my spark enough to keep my motor cool, and it boils the water pretty severely. Would like very much if you can tell me what is the trouble and the remedy. Again, do you think it would be of any advantage to drain all lubricating oil from the oil pit and put in kerosene and run awhile and then drain out and fill with fresh oil in order to remove any gum or sticky substance in bearings or would it be injurious to the bearings?

Reply.—From your description we should say that your carburetor needs adjustment. Knocking is often caused by too rich a mixture. The burning of the excess gasoline, as the throttle has to be well opened to get much power, creates extra heat, more than the radiator will care for. In other words you are wasting fuel and not getting power. To adjust for less gasoline at high speed it is best to reduce the tension to the auxiliary air valve spring, if provided with one, which should not weaken the mixture at low speed. If your carburetor is of the floating ball type the adjustment will have to be by means of the needle valve. If the motor does not run well at slow speed after adjusting for high speed, it will be necessary to close slightly the "fixed" air opening, or use lighter balls. Had you mentioned the make of carburetor used we could have advised you much more definitely. Your crank case should be carefully cleaned out occasionally, but you should not run for any length of time with kerosene only in the crank case, before putting in fresh clean oil. Get all the kerosene out before filling anew.

991 **May Be a Leaky Float Valve.**

From Thomas Graham, Nebraska.—I would like to ask you a few questions about my model T Ford car, 1910. Sometimes it is hard to start. It is equipped with a Holley carburetor and this floods so that I cannot get it started. The float needle will not shut off the gas when the car is idle. I have lowered this needle but still it leaks. Will you kindly tell me the best way to start the car when it acts this way? Do you think a new carburetor would help any? I use Briggs' master vibrator and like it well.

Reply.—Your principal trouble is apparently due to a leaky float valve. The remedy is to either have this valve ground until it shuts off the gasoline when the car is idle. The float may be heavy and not rise sufficient to close the valve. If you are to use your car without remedying this carburetor defect you should carry a good strong man to work the excess gasoline out of the engine until it starts. We know of no other way unless you attach an independent auxiliary air supply valve between the throttle and cylinders, in the manifold, to weaken the too rich mixture that the carburetor furnishes when starting. A new carburetor, or one that does not leak, is the only rational way to remedy your trouble. A good master vibrator is a very sensible addition to any ignition system employing more than one vibrating spark coil.

992 **Clutch Lubricant.**

From G. S. Barnes, California.—I have a No. 27 Buick 1911 car. I have trouble with the multiple disc clutch not holding. Have had cork inserts put in but they do not wear well although they hold all right for a time.

Also oil leaks out of the multiple disk oil box badly. Is there any permanent remedy? Can a cone clutch be attached? If so at what cost? Am told by local agents that all machines of this number have the same fault. Have written the factory and they tell me to take up the matter with the local agents so both seem to want to play horse. Please answer through your trouble department.

Reply.—The Panama Oil & Grease Company, 159 W. 51st Street, New York, manufacture a patented article called "Multiple Disk Clutch Compound" which is used to a large extent in model 27 Buick and other cars using multiple disk clutches. It is recommended by the New York Buick distributors. The quantity required for one filling is about 1½ gallons. Five gallons should last the life of the car.

993

An Old Model.

From Ferd Schuman, Iowa.—Please inform me what is wrong with my model L Schebler carburetor, equipped on my Cadillac 1910 model car? When the throttle is about half open the motor misses and sometimes hangs back because the motor is starving for gas. But as soon as I open the throttle a little more, the motor works fine. Also when I open the throttle very quickly the motor picks up very slowly. What do you think is my trouble? I have a new needle but it does not do any good. Do you think the needle guide is worn so as to hold the needle from working O. K.? If so, could I remedy the same by getting a new guide? Also if you think the trouble cannot be overcome, please state so to me.

Reply.—Taking the date of your car's model as a cue, it is more than likely that your inlet valve stems or guides are so badly worn that sufficient air enters at those points, with the throttle partly closed, to seriously impoverish the mixture. We consider this very much more likely than that the needle guide is badly worn. You can secure any new part for this carburetor, as all parts are interchangeable. You should not encounter such trouble as you describe, when opening the throttle quickly, for the reason that never under any conditions, except in case of life and death, should the carburetor throttle be jerked open, resulting as it is liable to, in an unnecessary strain upon the motor, tending to very materially shorten its life of usefulness and efficiency.

994

Maybe Due to the Brake Band.

From Andrew Speltz, Minnesota.—Have a Ford model T touring car. The car starts with a jerking motion. The steering wheel post shakes up and down and everything on the car fairly rattles on starting. Stopping the car has somewhat the same effect. The car was purchased last fall and is supposed to be 1912 model. I replaced the brake linings which are Raybestos with wire for new ones of the same kind and the trouble was still there. Then I replaced these with linings of the same kind without wire. These improved the starting somewhat for a while and then the old trouble began again. Keep plenty of oil in crank case and I try to adjust bands properly. What do you think is the matter?

Reply.—Your clutch or brake band does not take hold as it should, and does not release properly. It may be your fault in not operating slowly, it may be you have not adjusted the brake bands properly and one of them drags while the other holds. If you are not sufficiently well acquainted with method of making adjustment, almost any garage mechanic should be able to instruct you in a few minutes. We do not think your trouble at all serious, simply that the adjustments are made too tight. You should study the Ford model T instruction book and follow directions implicitly.

995

Lubrication Trouble.

From Martin Olson, Iowa.—I am the owner of a 1910 model T Ford car and have trouble with grease running out of the brake drums and getting on the tires. The grease also seriously diminishes the efficiency of the emergency brakes. The grease does not pass the felt washers but runs out between the cup or part containing the roller bearing and the axle housing. If you can suggest a remedy I will appreciate it.

Reply.—If your transmission is badly worn from use, as it possibly is, the only remedy outside of renewal of worn parts or a thorough shop overhaul will be to use a heavy grease, one that is unaffected by high temperature, such as is advertised by practically all manufacturers of motor car and gas engine lubricants. Tell your troubles to the manufacturers and they will advise you the grade to use.

996

Needs Extensive Repair.

From R. B. Vaughn, Georgia—I have been having some trouble with the front cylinder of my model F Buick two-cylinder touring car. When the spark and gasoline throttles are closed this cylinder does not fire at all, but with the spark throttle open and the gas throttle advanced about one and one half inches it fires about one half of the time. Running in high gear it rarely ever misses but occasionally the engine will skip with a back fire at the carburetor, and the engine does not pull good in high gear. I think the transmission slips a little sometimes and sometimes it sticks and I cannot change from high to low without stopping and loosening the gear by pulling the transmission out with a long chisel.

Going back to the front cylinder that does not fire only when running in high gear, there seems to be a good spark at the defective cylinder and I do not think the trouble is in the spark plugs because I tried new ones and that had no effect. The valves seem to be in good condition and this cylinder has good compression and it seems impossible to set the carburetor so both cylinders will run evenly. I am using a Schebler carburetor.

I am also having some trouble with the water circulation. After running about 5 miles the water in the radiator gets very hot and most all boils out and then the engine gets very hot. The system has a pump that I think is out of order but cannot find the fault. Please send me at once all the information you can give concerning this car.

Reply.—It looks very much as if your motor needed some extensive repairs. You do not mention it, but probably the missing in the forward cylinder is due to an excess of oil. This should show itself in an accumulation of carbon on the spark plug. The back fire at the carburetor usually devotes too weak a mixture, too weak exhausts valve springs, or poorly fitting inlet valves in their guides. To explain but a few of the causes which might result in the conditions you note would take at least a goodly sized volume. What you need is a thorough overhaul by an experienced mechanic, which might cost more than the motor is worth. We do not believe that we could materially assist you in your trouble, which might properly be diagnosed as senile motor decay with general breaking down of its various organs.

997

Use Thicker Oil.

From Thomas Jowett, New Jersey.—My car is a Model S Ford. I have always had considerable trouble to maintain a proper level of oil in the crank case. Some time ago, I disconnected the tube leading from the oiler to the front bearing, and tapped it into the crank case, but even then, with the oiler working at

capacity, it is not satisfactory, compelling additions to be made through the breather tube. Consequently, I have either too much or not enough. Do you think that if I had two large glass oil cups tapped in so that each of the depressions in the crank would have oil leading to them direct, would answer, or if not, what would you suggest?

Reply.—Your plan would, no doubt, work out satisfactorily, provided, of course, you do not forget to shut off your two oil cups every time you stop the motor. Our advice would be to use a considerably thicker and higher fire test oil for two reasons, first: it should not take so much to lubricate the motor properly and the lubricator should have sufficient capacity for the reduced supply, and second owing to the fact that your car has been run some time a thicker oil should give you a better "pack" between pistons, rings and cylinders. A high grade oil compounded with some cylinder stock, rather than a straight viscous oil of either high, medium or low fire test, would probably be preferable.

998

Magneto Trouble.

From the Ferguson Garage, Pennsylvania.—We would like to ask your advice in regard to a Hudson 30, 1911 model car. The engine runs each cylinder separately, but with four cylinders on goes with a gallop and is not regular. It has a Bosch magneto that has just come from the factory repaired and timed same as before it was sent away. The coil is new. It has a Stromberg carburetor and no matter how adjusted, works the same.

Reply.—Your car is equipped with a Bosch dual type magneto. This magneto has two separate inter-rupters, one for the battery circuit and the other for the magneto. Had you gone sufficiently far in your investigations to prove that both the magneto and battery circuits were working properly when on but one cylinder, it would have proven that the magneto was working properly. If you have disconnected the secondary leads to the plugs without shortcircuiting them on some part of the engine, you may have ruined your magneto windings or condenser. The fact is you have told us very little of assistance in answering your query. Exhaust valve springs that have become "set" could cause such trouble as you describe, from allowing more or less of the burnt gases, or even air, to enter with the partial closing of the throttle. We are inclined to this belief. Irregular running with the throttle nearly closed may also be caused by spark plug gaps being too long.

999

Too Little Gasoline.

From E. L. Dillon, New York.—I would like to ask you in regard to the slow starting of my old Model 1911 E. M. F. car. It takes ten or twelve turns of the crank to start the engine. It does not seem to get enough gasoline by the suction. If I put gasoline in the priming cups it will generally start but sometimes it fails even then unless I put fingers over the air vent. The batteries are O. K. Please tell me what you think the trouble may be?

Reply.—The fact that you can assist in starting by "priming" and holding fingers over the air inlet would indicate, as you surmise, too little gasoline, or a mixture that will not ignite unless the proportions are nearly perfect. If your ignition is not just right, vibrators not properly adjusted, plug gaps too wide,

timer worn, ignition cable defective, etc., it might account for the condition, but it is more liable to be caused by improper adjustment of the carburetor (insufficient gasoline for slow speed), a carburetor with too large a fixed air opening for the heavy and hard-to-vaporize gasoline, leaks between the valve stems and their guides, leaks between the carburetor and valve chests into the inlet manifold, exhaust valve springs. We are, of course, assuming that your compression is good, not fair.

1000

Leaky Tanks and Starting.

From W. H. Wilder, New York.—I have had three automobiles and all of their gas tanks leaked, some more and some less. I have one Brush runabout where the tank is just bound to leak. It is rivetted and then soldered at the bottom and in spite of five different good tinsmiths it will leak through and around the rivets. When covered completely with solder a circular crack will occur and a leak. This leak will not be heavy but it is annoying just the same. Now, the question is, who knows of something that can be put into the tank that will coat over or fill very small leaks and not interfere with the gasoline and carburetor and stop up the leaks. Of course, it must not interfere with the needle valve or flake off but should stay inside the tank.

What will start a Brush car that explodes just once every time you crank it? Then it will not go over the second explosion and you can crank and crank and every time you crank it will explode once but with not force enough to carry over to the second time. The compression is extra good.

Reply.—It is to avoid the tendency to leak that the best gasoline tanks are either brazed or electric-welded. We do not know of anything that you could use if solder, properly applied, will not do the trick. You might possibly be able to have the tank galvanized inside and out. It would cost more than a tank properly constructed to hold gasoline. We do not know what will start your Brush car if there is "extra good compression," as you say. Weak explosions are usually caused by a mixture containing too little or too much gasoline, or leaks past the valves or piston rings. If past the rings put a teaspoonful of heavy oil into each cylinder before "priming" the motor. If the valves leak, have them ground. If the mixture is too weak increase the fuel. If too rich reduce it. Try new batteries, and test out your ignition.

1001

From Anthony Huber, New York.—It would appear to writer that the person who makes the replies to subscribers ought to fortify himself with some information upon the subject before jumping to the conclusion ventured in 978, page 42, current issue. The partition referred to has been discarded by the Ford Motor Company in their 1911 and later cars and to a large extent corrects (the removal of same) the very trouble J. W. Russell complains of. I did just this very thing with a Model T 1910 and have the same motor car still with the same engine, etc. You might advise users of Model T's that a thin oil works all right, if not used in too plentiful quantity. I find that when the clutch takes hold with jerks, oil is needful, when the clutch slips going up grade too much is available. I use a quart feed cup on the dash and feed same into forward part of crank case as needed. Never bother with the lower pet-cocks, since they

cannot be depended upon unless assured that the oil passage is free.

With new piston rings the oil will work up to the spark plugs, as I have found recently. With spark plugs that fire regularly this does not happen, or properly more correctly is not noticeable if it does. A quart of oil to 100 miles would seem from my experience to be enough for a Ford Model T. You might advise Mr. Russell to file off the dipping cups on the lowest part of his connecting rods. This prevents so much oil being lifted up into the cylinders and flooding same. The later connecting rods, as may be noted by the Ford catalogue repair parts, have these cups omitted.

Reply.—We have to say that the construction of Ford crank cases is well known to us, both of models previous to 1911 and since the discarding of the partition. We are not prepared to say that the weakening of the crank case by the removal of the partition has not been allowed for in this change, but we believe it has. The removal of the partition would not materially assist Mr. Russell, and as it might weaken the crank case itself we advised against it. Nor are we disposed to modify our advice as to the use of a heavy oil after the cylinders, pistons and rings have become somewhat worn in service. Neither shall we advise Mr. Russell to file off the dipping cups as suggested, as the manufacturers of the car do not advise it. If the oil is thin the dipping cups will splash too much for a worn engine, but if the oil is thicker they will splash less.

Although the several minor changes in design in Ford models may not be in the line of economical manufacture as well as in improvement, yet to market their cars at the astonishingly low prices fixed, it is absolutely necessary to simplify in every possible manner.

1002

Ether for Starting.

From C. S. Brush, Washington, D. C.—My car is a Maxwell AA. What would be the result of introducing a few drops of ether into the intake manifold for starting in cold weather? Would it be detrimental or dangerous to the engine? If not, would it give me the desired result of easy starting? With the low grade of gasoline now being used I fear that getting started is going to be a serious problem this winter.

Reply.—Ether is used to some extent to assist in starting. It should be used sparingly for its explosive action is powerful. We think the mechanical engine primers using gasoline are far preferable to the use of ether, which costs several times as much as gasoline, and is very much more explosive.

1003

A New Tire Bursts.

From O. M. Currie, M. D., New Hampshire.—I have a Ford five-passenger car, Model T, 1911. I had a new tire and a new tube put on the front wheel. It was done at my private garage by the man who runs a public garage here and who is doing a good business apparently. Immediately after the work was done I locked up my garage for the night. In about half an hour I heard a blowout evidently proceeding from the garage. I unlocked the door and went in and found a bladder of air as large as a peck measure protruding from the edge of the rim or between the rim and the tire that had just been put on. In about fifteen minutes this bladder of air bursted entirely, severing the tube in two and splitting it several inches.

Now why did this do so? As I have said the tire

and tube were both perfectly new and the tube must have been in good condition and quality as it would not have held to expand as big as a peck measure otherwise.

Reply.—The trouble was evidently due either to some damage done the tire when putting it on, or to an imperfect tire or tube. It might be possible to determine which caused the trouble by an examination of the tire but not otherwise. It is practically impossible to inflate a tire to the danger of bursting unless it be considerably weakened by some imperfection or injury.

1004

A Metallic Click.

From L. D. Davis, Iowa.—My Buick Model 29 Magneto and plugs seem to be O. K. but on opening the throttle quick there seems to be a metallic click but on retarding the spark it stops and there seems to be a loss of power. The valves have been ground. Model Schebler L. carburetor used. Some have told me it is the seating of the valves but I think it is in the carburetor, but have not been able to get it adjusted so as to stop it. If you can help me out it will be greatly appreciated. The cylinders seem to be working heavy. The car has been run 2,500 miles.

Reply.—The remedy we would suggest is that you do not open your throttle quickly, but moderately, and thereby materially increase the life of your motor, which is subject to bad straining when the throttle is handled in any such manner as you describe. Do you think a steam engineer would be likely to jerk his throttle wide open? It would be much more in reason to do this than in "yanking" open a gas engine throttle. We do not know what you mean by "cylinders seem to be working heavy." The loss of power is probably due to the retarding of the spark. Broken piston rings might cause the click; you may be running with too much gas as a result of too late a spark; your valves may leak; piston rings may be badly worn; and some one or more of a few scores of other causes may have beset you. Like a good many others you are blaming it on the carburetor when at least ten chances to one the trouble is somewhere else.

1005

Car Runs Unsteadily.

From O. H. Stewart, Indiana.—I have a 1910 Model T Ford and have had but little trouble until now. At times when running, the car will jerk a little, just enough to notice, and has been hard to start on the magneto—almost impossible to start. Yesterday I had it cleaned up. The wires leading to the timer were saturated with oil and the insulation was worn to the wire in one place. They were cleaned and wrapped well. I cleaned the timer, ground the valves, cleaned the plugs, and put in batteries to start with. Now when the throttle is down four notches, the car jerks and slows, and I believe it would stop if I did not advance the throttle. Then the car picks up and the jerking ceases. It misses very badly. I have a Master vibrator on. It is a nuisance as it is. Can you help me out? The man that did the work seems to understand himself.

Reply.—We shall advise you first to re-wire your ignition throughout, replacing both primary wire and secondary cable, using best wire obtainable. Do not use primary wire from the plugs to the coil as it is not sufficiently well insulated for the purpose. You did not say whether or not the motor missed badly when running on the batteries, but we judge that you have reference to running on the magneto. If you

will remove the small carbon brush at the terminal on top the magneto you will probably find some hairy-like carbonized particles of fiber attached to it, which should be carefully removed. If this does not stop the missing close the spark gaps slightly. It may be necessary to put in new plugs. If the motor has been run a great deal while missing explosions it may be necessary to remove the cylinder heads to clean out the carbon. If your motor runs well on the batteries and does not on the magneto, after having followed the above instructions it is more than likely that the magnets are demagnetized. Owing to the fact that the car has been used two or three seasons there may be leaks between the valve stems and guides that make the mixture too poor at low throttle. The Ford Motor Co. are using a new type of carburetor now that will handle the much heavier gasoline now being marketed. This is the best we can do for you in view of the limited information you have given us.

1006 Carburetor Leaks.

From Garrett Dyer, Kansas.—I am in trouble with my Kingston carburetor. My car is a Ford Model T purchased in March of this year, and is a 1912 make. The carburetor is leaking gasoline very badly. Last Sunday a friend and I went visiting. When about half way there, the engine suddenly died. After some cranking the thing started and stopped again. After three or four times acting the same way, we saw the thing was not getting gasoline all the time. We took off the carburetor and took it apart. We found a small piece of wool, or lint of some kind, in the needle valve. We cleaned the carburetor good, put it together, and put it on the machine. The engine ran perfectly, but the carburetor leaked at the bottom. I have been working with it ever since but cannot stop that leak. Can you tell me what to do? My friend owns a Whiting car, with a Schebler Model L carburetor, which he has run two years and has not given any trouble. He wants me to throw away my Kingston and buy a Schebler L. If I do so, what size shall I get to fit my intake manifold?

Reply.—The carburetor float valve needs grinding or the float is either loaded with gasoline, sticks, or is set so high that gasoline flows out of the nozzle. You or some mechanic of ordinary ability should be able to remedy the trouble. The fact that the Ford Motor Company uses Kingston carburetors should influence you before taking advice as to exchanging carburetors. It is rather expensive to get possessed of a carburetor changing mania. Ford motors take one inch carburetors.

He Eliminates the Cause of a "Grouch."

From P. G. Liederbach, Minnesota.—I see that J. L. Williamson, Wis., has a great deal of trouble with his car. When he says he is a "grouch" I think he is right. I think one must use some judgment in operating an automobile. One must use judgment in operating a binder, a mower, a gas engine, or any piece of machinery. There is no known piece of machinery but what will get out of order once in a while. Now, I think I know what car Mr. Williamson has, and it is a good one. That car is a low priced car but not a cheap car. Mr. Williamson seems to lament because the company did not use a tapered axle prior to 1912. He does not seem to realize that tapered axles are high priced construction, and are not found in low priced cars on account of the extra work involved. If he would put a piece of steel into a lathe,

taper it, then put in a key-seat, thread the end for a nut, make a castellated nut, and then drill the shaft for a cotter pin, he would be amazed at the work required. One should be grateful for this high priced construction in a low priced car. This construction does not obtain in any other low priced car that the writer knows of. He asks "Why the company does not drill holes into the axle housing to let out the oil?" What is the use of putting in holes when you do not need them? Instead of having greasy brake drums you have a greasy housing, and it seems to me this is only transferring the grease instead of eliminating it. The sum and substance of the matter is that he uses too much oil. If he will examine his car, he will notice that the housing has a downward pitch from the wheels to the differential which furnishes a natural drain for the oil, keeping it away from the wheels, but if too much oil is put in, this natural drain becomes inoperative and the oil flows to the wheels, making itself manifest by coming out of the brake drums. If he will take off the rear wheels, take out the bearings, stuff in about $\frac{1}{4}$ to $\frac{1}{2}$ pound of waste, he can say "Good night" to the oil.

Mr. Williamson says the pins of his car shear off. The reason for this is very evident. These pins are put in to keep the wheels from coming off, and the fact that they shear off shows conclusively that they convey torque to the rear wheels. If he will have new keys accurately fitted, or if he cannot have this done conveniently, put in a pin small enough so that it will not have to carry a torsional load, he will have no more trouble with sheared pins.

Concerning what he says about spark plugs, his friends must be different from other people's friends if they do not know what a spark plug looks like. I have yet to see the first motorist who doesn't know what a spark plug looks like, and furthermore I think that when a man owns a car and does not know what a spark plug looks like, it shows the height of ignorance, as I think nine-tenths of the joy of motoring comes in knowing your car.

I think if Mr. Williamson would investigate up-to-date splash lubricating, he will find that it is not constantly changing, as he contends it is. The oil is in a well or sump and from there it is pumped or conveyed by other means over a circuitous route to main bearings and little troughs wherein the connecting rods can dip and oil the cranks and throw the oil up to the pistons and then it flows back to the well again.

If he will grind off about 1-16 of an inch of the oil dip on the end of the connecting rod, it will probably eliminate the oil on the spark plugs on cylinders one and two.

I hope this will help others as well as "Willie Grouch."

In the Interest of Safety.

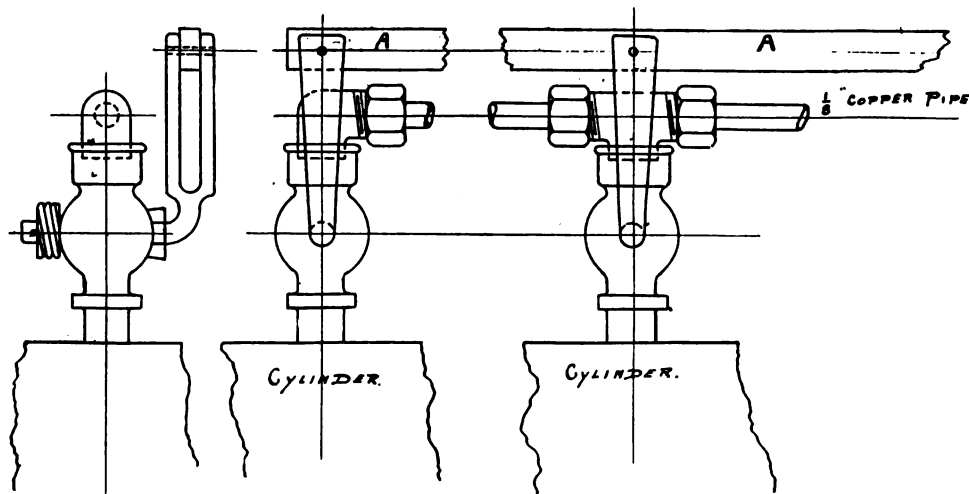
From C. H. Rathmann, Illinois.—I would like to have you promote the idea of making automobiles more safe. We should have a prominent automobile commission, something like a building commission, to take up complaints from every automobile driver, as the driver is the only man who gets into trouble and has the experience. This commission should make laws and regulations and see to their enforcement. Without something of this sort we will never have automobiles built as they should be to insure safety. I think I can show that it is impossible, as well as impractical, to take the point up with individual manufacturers. I have at present my fourth car

and each one was better than the preceding one, but we are far from having what we should have even now. Every one of them had brake rods about one-quarter to three-eighths inch in circumference. They should be twice as heavy to give the proper strength. I have broken them on every car I ever had. One of them broke on the down grade of a steep hill and it is nothing else than a miracle that any of the occupants were left to tell the story. Every other vehicle that travels on an incline of this sort is subject to the same danger for the same reason. I hardly see how any other remedy can be provided for this except an automobile commission.

Another dangerous, not to say insane, idea is the thin metal gasoline tank. Consider for a moment that we are climbing up a hill and sitting over about twenty gallons of gasoline inclosed in a four-cornered box made of forty-five gauge tin. We must all agree to the deniable fact that there is only one remedy and that is more stern and strict laws to bring safe conditions.

A Simple Starting Device.

From G. H. Waltman, Pennsylvania.—A very simple device for starting the engine can be easily assembled



and installed by first removing the pet cocks on the cylinders and replacing with those which have a split handle. Connect all the split-handles to a rod A A, which is long enough to pass through the dash board, where it can terminate with a handle of any convenient arrangement. It is now clear to see that by one push or pull on the rod all the pet cocks can be opened, or closed from the driver's seat and avoiding the getting out, raising and closing the hood.

Next run a one-eighth inch copper pipe along the top of the opening of these pet cock cups with a T connection at each pet cock excepting the last which terminates with an elbow. These T's and elbow, as shown in the illustration, make connection with the one-eighth inch pipe line and are not connected to the pet cocks, but allowed to only lie or rest on top of the cups. The other end of this pipe line is run through the dash and connects with a small tank supplied with a small force pump; or a better arrangement is to use instead of the tank a K-E-W three-way-valve pump, and then connect the pipe line to the main gasoline pipe line or gasoline tank.

To operate it is simply a matter of throwing open all the pet cocks with one push or pull on the rod and by forcing gasoline through the pipe line, all cylinders are instantly primed. With the cocks again closed and the

spark applied in the usual way, the engine is most likely to start.

We have called this our "priming starter" and in general principle it is the same as the majority of starters on the market today and may be easily and inexpensively installed.

The writer does not guarantee it to positively start the engine every time, but can truthfully say that a very large per cent. of trials it has done the trick, and when it has failed of itself, one turn of the crank is all that is necessary. It will be found a big help to those having engines which start hard or require a good deal of cranking.

For That Leaky Carburetor.

From L. E. G., Michigan.—I notice a great deal is said about leaky carburetors. Now I will try and explain troubles I had with one. I put a new Kingston, late model, on my car and it leaked considerably and more so after shutting down the engine. I had it down a couple of times, also had it taken down by others and tightened, but of no avail. After having some trouble with the gas line, I took down the tank and pipes, also the carburetor. Well, from the stuff I found in the tank one would suppose I was collect-

ing souvenirs from some oil works. Rubber, dirt and scale were formed in the tank, also the pipe was stopped up so I could barely blow through it. Then I dissected the carburetor, cleaned the bowl, took out the screw to the float valve and removed the valve. There was the leaking trouble. Some fine ravellings were on the seat but could not be detected by blowing through the opening. After thoroughly cleaning all parts and replacing, I strained my gasoline through a chamois as I had been instructed to do months ago, but thinking I might be causing some one else a little waste of time I neglected to do so until lately and I want to say right here, when I stop at any place for gasoline I will guarantee it will be put through my chamois regardless of what they say about their gasoline being strained, etc. I think if some of these automobile men who are having trouble with their carburetors would give the whole thing a good cleaning out and then strain all their gasoline through a chamois they would have less trouble afterward.

That Battery-Magneto Puzzle.

From M. E. Sanders, California.—In answer to No. 943 of August, I would like to give you my experience with this same trouble. The first time it oc-

curred was on a Flanders 20 where the batteries had become weak and had to be replaced, this being done by the handy boy in the shop who had put in batteries lots of times. But when we tried to start the engine it would not start by cranking but if we would spin it over a few times and then vibrate the button till the engine got in motion, then switch over on the magneto, the engine would run all right. I looked at the batteries to see if they were connected right (that is from carbon to zinc) and found they were all right, but on a close examination I found that the boy had taken a jacket off one of the cells in the metal case that held the batteries and by so doing grounded the batteries. As soon as I put the jacket on the trouble was gone. That I think was the trouble with Mr. Jamison. One or two of his cells were grounded and when he changed and only used two of the cells the ground was cut out and the two batteries worked all right. The second time this happened I found that one of the floor boards had chafed the lead wires that run along the side of the frame to the front of the dash.

Things to Remember.

From Charles B. Vahrenhold, Illinois.—In coming to a short muddy place in the road I thought I could rush through without putting on the chains. I got stalled and in trying to get out I cut one of the tires so badly that it cost me \$7 to have it vulcanized. It occurred to me that it might be well for automobile drivers to take no chances in cases of this kind, but to put on the chains at once, then they will not be obliged to get down into the mud and have the same experience as I had. It is also a good plan when touring in the country to be extremely careful about turning corners. You never know what is ahead of you. Where the road is not level too rapid a pace is likely to overturn the car. While I am about it, I may as well say that in touring it is a good plan to carry a spade.

Two Motors Instead of One.

From A. C. Helbrig, Illinois.—As a matter of general interest and information to your readers in the line of future progress and development in motors, would it be possible and feasible or practical, in order to get more power and more constant torque for a car, to mount two of our modern, light, four-cylinder, four-cycle motors in line (one before the other) making practically an eight-cylinder motor?

If advantageous, in your opinion, how should they best be connected, that is, in regard to the position of the pistons in each motor, in relation to those in the other, viz., how far should one be advanced ahead of the other to get the best results?

Furthermore, would such a combination give greater efficiency in proportion to the number of cylinders, than a six-cylinder motor? There are, of course, many other interesting points and questions in such a proposition and if such a discussion is permissible in your columns, the writer would be very much pleased to note same at your earliest convenience.

The Rattling Brake Rods.

From C. D. Oldknow, Pennsylvania.—To stop the annoying rattle of the brake rods in the bracket holding the same, we had a nut brazed on each side of the

thin sheet iron forming the bracket. These were then drilled the size of the brake rod. The rattle apparently ceased for awhile, but a still more annoying trouble appeared, in the shape of mud and dirt collecting on the rod and preventing its movement through the hanger.

Greasing the rod would permit a free movement but only aggravated the cause by the grease collecting more dust and dirt and again "choking" the rod.

The writer has found the solution is to remove the bracket, and to prevent the vibration of the long small brake rod, tie it rather tight to the cross rod which connects the two running boards, either with a loop made of heavy wire or very heavy cord.

That Knock in the Maxwell.

From F. W. Steinbright, Pennsylvania.—I notice No. 939 is troubled with a knock in his Model H. C. Maxwell which he seems unable to locate. I have a car of the same model and have also had some trouble in locating a knock and my experience may be of value to this gentleman. The ends of the cylinders are hung on a bolt which goes through a yoke attached to the frame. After worrying for some time about a knock in my engine, I found that this bolt and yoke were worn so much that when the engine was put to a heavy load, the whole cylinder would jump and this caused a knock in this yoke. I trust this information may be of value to your subscriber.

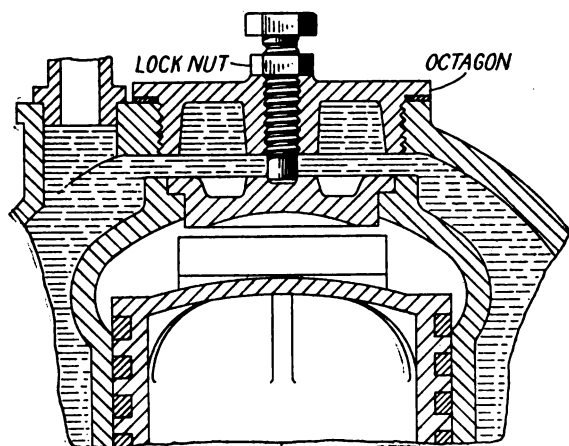
Clutch Trouble.

From Subscriber, Connecticut.—Can any of the Ford experts give me advice as to how to overcome the gripping and jerking of the clutch when changing from low to high gear? Oftentimes when starting my car, the clutch does not take hold smoothly, and when overhauling it this winter I would like to know what to do to avoid this. How would it do to put in two new discs or rings in the clutch? This is a 1910 car and has had hard service.

Leaky Compression.

At the suction stroke of a motor a vacuum is created in the combustion chamber, so that if there is a leak between the combustion chamber and the water jacket, water will be sucked into the combustion chamber and its presence will be sufficient to affect the mixture. During the compression stroke, since the mixture within the cylinder is compressed to from 40 to 80 pounds per square inch, depending upon the design of the motor, it will be forced through the flaw into the water jacket of the motor. During the power stroke, considering the average motor, allowing that the piston rings are tight, and that there is no leak from any other quarter that falls to the usual expectation, since the pressure during inflammation runs up to nearly 300 pounds per square inch, power will be lost at an enormous rate. During the scavenging stroke the products of combustion are gotten rid of, and if there is any water in the cylinder as the result of a leak from the water jacket, it will go out in the train of the products of combustion in the form of steam. Unfortunately, a very trifling leak between the water jacket and the combustion chamber will shut down the motor. The illustration shows the top of the cylinder with a cover at the extremity over the combustion chamber, and a second cover over the waterjacket. The outer cover screws into the wall of the waterjacket

and is made tight by pressing against a copper-faced asbestos gasket. A stud is threaded through the outer cover, and the end of the stud engages a cavity in the combustion chamber cover, so that when the stud is screwed in it presses against the combustion chamber cover, and, by means of a copper-faced asbestos gasket around the seat formed out of the dome of the cylinder, the cover is set down tight. A defect in the gasket, or failure to set up on the stud, will result in a leak, and

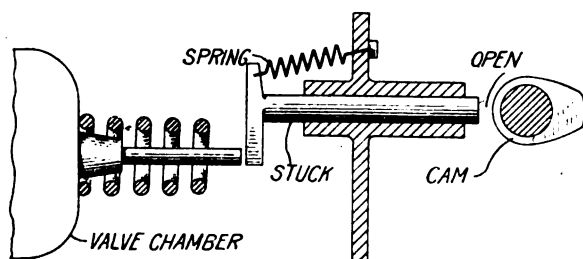


How to Make the Top to the Cylinder Tight.

disastrously affect the good performance of the motor. This illustration shows but one of the many plans that are in vogue in motor designing, but the principle of maintaining tightness of the combustion space within the cylinder, so that there will be no leakage to or from the waterjacket, is clearly brought out, and the automobilist who has a mysterious form of trouble with his motor should examine into this phase of the operating problem and find out whether or not the covers are tight.

An Annoying Sound.

If a valve does not seat on time or fails to seat properly it often makes a troublesome wheezing sound. If the valve stem is offset, throwing the plane of the tappet out of the plane of the stem, the valve is lifted against



Showing How It Sticks.

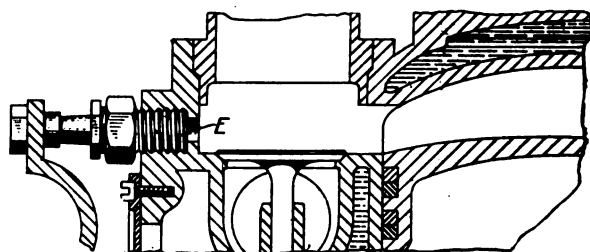
the pressure of the spring by contact with the foot of the tappet under the exertion of the cam as it presses on the other extremity of the tappet. Owing to this offsetting relation, the tappet is likely to bind in its guide, and if the condition of lubrication is imperfect the bearing in the guide will run dry, and the tappet will stick, leaving the valve open despite the pressure of the spring. If a small spring is used to pull the tappet back against the cam, it should save this trouble, unless it becomes weakened. A grease cup, so placed as to lubricate the guide bearing and prevent the tappet from running dry, will be a step in the right direction. The strength of the tappet spring should also be looked after. The illustration shows a design that may cause this binding unless well lubricated.

How to Avoid Using too Much Oil.

From L. C. Reitze, Denver, Colorado.—I notice an article from Nelson A. Heffner, Kentucky, No. 925, where he has had a good deal of trouble with Buick Model No. 10, using too much oil. I have had similar trouble. If he will have a good man take down his engine and have about six or eight holes bored in the groove of the lower piston ring on a downward slant, and also about six holes in the lowest groove of each piston, he will overcome all his troubles. For a while I could not get over 20 miles on a quart of oil, but since having the above work done I am able to get from 100 to 125 miles on a quart of oil. His trouble is the excess oil in cylinders short circuits his motor, then carbon accumulates in the valves, and he loses compression. I have not had to grind or fit my valves in six months, as I wash out my motor about three or four times a month with a pint of kerosene through the manifold.

Position of the Spark Plugs.

It is pretty well known that when a motor is new and is being tried out, lubrication should be maintained so that it will smoke a little, but after it has reached its proper efficiency in running qualities, the quantity of the lubricant should be reduced so that the exhaust will show no sign of burnt lubricating oil. One of the serious effects of too much lubrication is the fouling of the spark



Spark Plug Placed in the Chamber Horizontally.

plugs, and if they are placed horizontally, as shown in the illustration, the chances of fouling are rather increased as the lubricating oil has a tendency to splash into the cavity of the spark plug. When the spark plugs are placed vertically at the top of the cylinder, the lubricating oil drains out, runs down and drops off. Under such conditions spark plugs are self-cleaning in a way. There is one advantage in having the spark plugs placed horizontally for then the operator of the motor will be compelled to more carefully regulate the supply of lubricating oil to save himself the trouble of taking the spark plugs out frequently for the purpose of cleaning them. A horizontal spark plug is shown in the illustration at E.

An Envious Distinction.

Lee Meriwether, the well known author, tourist and motor scout, who has driven Maxwell automobiles more than 100,000 miles, has been elected president of the 50,000-Mile Maxwell Motor Club, recently formed as a national organization to encourage touring and reward owners of Maxwell automobiles according to the mileages they have made.

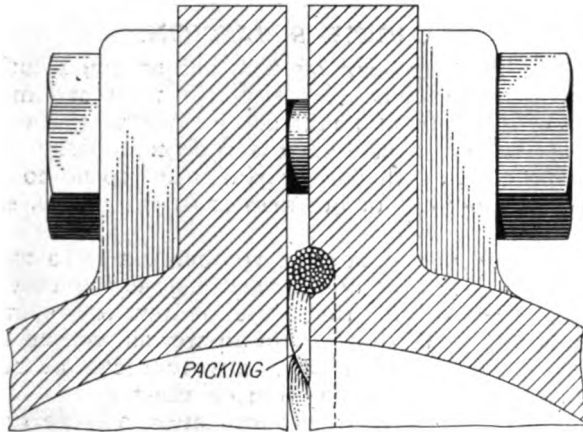
Mr. Meriwether is the first motorist to qualify for one of the gold medals which the Maxwell-Briscoe Motor Company is presenting through the club to all owners who have traveled 50,000 miles or more. Enrollments and declarations of great mileage are being filed rapidly with the secretary of the club at No. 3 West 61st street, New York, and dealers in Maxwell cars

throughout the country report eagerness of owners to join the club and participate in its many activities.

Naturally the largest number of owners are qualifying for the silver medals which go to the 25,000-mile class but the 50,000-mile class has shown a large prospective membership. Mileages as high as 110,000 have been reported by many members.

Packing for a Leak.

Not only is lubricating oil expensive but if wasted it "makes a dreadful mess." In lubricating the crankshaft, if it is done by "splash," the difference between a condition of profuse lubrication and failure lies in the shifting of the level of the oil in the lower half of the crank-



Showing the Method of Packing as Seen Before Clamping.

case from the working level to a lower point. If oil leaks out around the seams of the two halves of the crankcase, the capacity for leakage will be very great, and the pump employed for purposes of oil circulation may fall below the necessity under such conditions. The illustration shows a method of packing the joint of the two halves of the crankcase to prevent loss of oil. The finished face of the flange of the lower half of the crankcase is scored, using a diamond-pointed chisel for the purpose, and a piece of string is imbedded in the score protruding above the common level, so that when the two halves of the crankcase are bolted together the string is compressed and the joint is made tight.

Cost of Electric Truck Service.

In Saginaw, Mich., the City Light and Power Companies now have two electric trucks in daily use, one a 1000-pound truck used by the Gas Company as a meter and service truck and the other a 2000-pound truck used by the Power Company as a service and line repair truck. These trucks were purchased during the past summer from the Argo Electric Vehicle Company of Saginaw, and have given most satisfactory service under all conditions. The smaller truck was put in operation June 12, 1911, and was used by the Power Company in connection with extensive pole and line work that was being done. Instead of purchasing an additional team and wagon, which would have been needed at this time, it was thought best to try an electric truck. It was found, however, that a 1000-pound truck was too light for the heavy loads of wire and line material and later on a 2000-pound truck was ordered and placed in operation in October. The smaller truck was then transferred to the Gas Company to be used as a meter and service truck, taking the place of two horses and wagons. The superintendent says:

"From the day the first truck was put in operation, a record was kept showing the number of miles traveled

each day, and the actual number of hours and minutes each day that was spent in traveling as distinguished from the time that the truck was standing still while the men were at work at any one location, and the number of men each day that were employed upon the work."

"The maintenance cost of the automobile truck was found to be greater than that of the horse and wagon, but the extra amount paid in wages in the case of horse and wagon operation still resulted in a saving of nearly 50 per cent. in operating costs by the use of the truck."

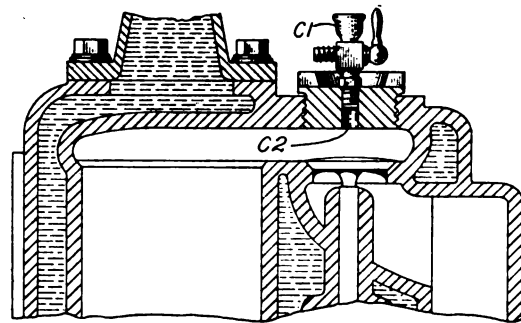
"Our records show that the total yearly cost of the automobile truck is about 50 per cent. of the cost of the horse and wagon in doing the same work, which in our case means a yearly saving of nearly \$1,000.00."

Remedy for Skidding.

In a notice in relation to the prevention of skidding that has been going the rounds of the press, it is stated that the moment the rear wheels "start to slide off to one side, turn the front wheels sharply in the same direction the rear wheels are skidding." This may imply to some that if the rear wheels are slipping to the right, for illustration, the front wheels should be turned to the right. The opposite turn is the correct way. The thing to do is to keep both front and rear wheels in line.

A Persistent Noise.

There are several different kinds of noise and among them the noise of safety, and the noise of danger. These noises are both often heard about an automobile and both are objectionable, although one is far more so than the other. The noise, however, that carries with it the suggestion of danger may be remedied by the repair man, but the one that denotes safety is often impossible to get rid of. This last sound, or noise may be due to some structural quality of the motor the character of which does not interfere with the mechanical performance of the automobile and yet it may be annoying and impos-



Showing the Place That Causes the Noise.

sible to get rid of. The illustration shows the section of a cylinder with the priming cock, 61, placed in the valve cup leaving a cavity, 62, due to the fact that the valve cover is relatively thicker and the thread portion of the cock is shorter than the distance through the section of the cover. The cavity thus formed is liable to produce a whistling noise that will test the ability of the repair man to correct.

Five gallons of gasoline will generate 8,000 cubic feet of gas which when ignited will expand to four thousand times that space or 32,000,000 cubic feet. This will give some idea of its terrific explosive power.

Gasoline is a product of crude petroleum and it is the lightest, most gaseous part of it. There is a vapor rising from gasoline continuously when it is exposed.

Automobile Dealer and Repairer

A Magazine of condensed and compact information for busy readers.

PUBLISHED THE MIDDLE OF EACH MONTH BY

THE MOTOR VEHICLE PUBLISHING CO.

71-73 Murray Street, New York

Telephone, 6765 Barclay

Post Office Box, 654

Entered as second-class matter at the Post Office in New York City.

M. T. RICHARDSON, President and Treasurer.

A. A. HILL, Editor.

F. R. WHITTEN, Secretary and Advertising Manager.

TERMS OF SUBSCRIPTION.

One Copy, One Year, Including Postage.....\$1.00
One Copy, Six Months.....60 cents
Single Number.....10 cents
Foreign Subscriptions.....\$1.50, or 6s. 3d.

Remittances should be made by Express Money Order, Draft, Post Office Order, or Registered Letter. Foreign remittances, where possible, by International Money Order.

ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, OCTOBER, 1912.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matloek House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

A SIGNIFICANT STATEMENT.

At a recent meeting of British automobile manufacturers, for the purpose of doing something to avert the continued invasion of cheap American cars, and for the additional purpose of considering a giant merger of firms with a capital of several million dollars to make cheap automobiles, one of the speakers, Mr. S. F. Edge, made the following remark:

"Behind its tariff wall America has built up a bigger motor car industry than all the rest of the world put together. If it had not been for the high United States tariff England and France would have captured the American market long before the present American companies could have been established."

Just at this time when assaults are being made in this country on the protective tariff principle, the foregoing is significant. It comes from a non-political and outside source, and consequently, should be given more weight than partisan expressions made during the heat of a political campaign. Anything that is responsible for building up a business that employs a capital exceeding \$200,000,000 and that employs something like 100,000 workmen, should not be tampered with unnecessarily and should be given the most careful consideration before it is changed in any way. The automobile business in this country is doing very well, and it is a good policy to let well enough alone.

But it should be understood that it is with low priced cars only that we can compete with the British manufacturers. This is due principally to the fact that in Great Britain, as a rule, any one who can afford to own a car at all, can afford to own a high priced one. It is either a "feast or a famine" there. The middle class, which in this country can afford a low-priced car, is sadly wanting there. Hence, no great attention has been paid to supplying a low-priced car for them. On the other hand, in this country by far the greater demand is for a low-

priced car, and this demand has been wisely and ably supplied.

There is still another reason, however, why we can now compete successfully with British automobile manufacturers. In every country where labor is cheap, the first step in production is to employ hand rather than machine labor. In countries where labor is high-priced, the first step is to employ the machine as much as possible. And until England discards much of its hand work and employs the machine we will be able to continue in competition. But when they use the machine as we do, then there will be no way under the sun by which we can compete with them except to pay the same wages as they do.

ANOTHER SOLUTION.

Thomas A. Edison offers a rather unique solution for the trust problem. He says the trust can make 30 per cent. profit and still sell as low as the small producer who makes but 6 per cent. profit. This being the case, all the big producer has to do to put the little fellow out of business is to cut prices, say, 10 per cent.

His method of maintaining competition is to make it unlawful "for any one to sell below the cost of production"—cost to the little fellow, of course. Quite likely this remedy would answer as well as any yet suggested and as well as any that can be suggested, but it would be far from effective.

If, as Mr. Edison says, production on a large scale gives five times the profit as production on a small scale, each selling at the same price, the small producer will either soon join forces with the large one or combine with all the other small ones. Then it will be but a single step to make the two large combinations into one larger one.

The point is that there is no way to enforce competition upon those who have found combination far more profitable. Mr. Edison's assertion that the large producer can make five times the profits of the small one is a pretty good reason why there will soon be nothing but large producers. No business man will be content to make 6 per cent. profit when he can as just as easily make 30 per cent.

As to the remedy for over-charging and other evils in connection with monopoly, that is another question, and as stated, no real remedy has as yet been suggested for it.

DANGERS OF SELF-CONFIDENCE.

Accidents are not so much due to ignorance of automobile running as to recklessness. The dangerous man on the highway is the one who prides himself on his skill—who can "take a turn on three wheels," who can "come within an inch of another car and not touch it"—who is confident of his own superiority as a driver and who enjoys "doing stunts."

It is true that when ignorance of driving is added self-confidence and recklessness, an accident is sure to follow sooner or later. But the careful driver has no accidents, whether he be an experienced driver or not. Of the nearly two hundred accidents in connection with the navigation of the air—and they were nearly all fatal, of course—a very large proportion were where the victims were adepts in flying machine operation. They delighted in "making figure eights" and in dipping and turning for the benefit of the gaping spectators safe on the ground. In some cases, the machine became inoperative and came down like a

stick despite the efforts and skill of the operator, but would this have been the case if it had been properly overlooked and tested before having been sent up into the air?

So likewise automobiles have suddenly become disabled—nuts have fallen off, brakes have failed to work, wheels have given way—but this would not have been the case if the cars had been properly inspected before being taken from the garage or driven wisely after being taken from it.

ICONOCLASTIC.

By way of digression, how this day and generation are shattering old theories and habits of thought: Now appears a wise scientist who maintains that the fresh air craze is mostly nonsense. He says a good deal of poisonous air is found nowhere but in the imaginations of those who are afraid of it.

To clinch the force of his logic, he cites people and horses who live in the worst of ventilated places in London all their lives and who yet suffer no apparent ill effects. They live to a green old age, their health and strength being better than the average.

He might have punctured the sunshine craze while he was about it. The Esquimaux, who live under the ground in the worst of ventilated places, and in foggy, damp and sunless localities, are longer lived and far less feeble and wrinkled than the native Porto Rican who lives in sunshine and in habitations where foul air cannot be confined.

We are inclined to think that the thing that is most inimical to modern civilization and life is not foul air or lack of sunshine, but weakened nerves incident to the brain racking rush of industry and business. Let us not forget that primitive man got his living quite by the work of his hands and body, with the brain as a guide only and not as a working money earning force.

POWER BY WIRELESS.

This is indeed an age of material marvels, and wireless telegraphy seems to be one of the most wonderful of them. It is now reported, however, that electric power may be transmitted by wireless, but with how much of a basis of fact it is impossible to say. Indeed, the transmission of electric power by wire has not been attended with entire success; that is, for long distances.

But the transmission of power by either method is in its rudimentary state. When it can be done without a loss of power in transmission—as it surely will be—and when the tides of the ocean are harnessed—as they surely will be—the question of heat, light and power will be settled for centuries no matter whether the coal, wood and oil of the earth be exhausted or not.

As to that matter, a well-known automobile consulting engineer is willing to go on record with the statement that in less than fifty years automobiles will be run by wireless. He does not mean by this that it will be necessary to carry around storage batteries but that the current may be caught without the use of the high voltage now necessary. He is also of the opinion that in ten years from now gasoline driven cars will be a thing of the past.

MONEY COMING IN.

According to the Bureau of Statistics in Washington, our iron and steel exports now average \$1,000,000 a day, it never having been one-third of this enormous sum

prior to 1900. Most of these exports are automobiles, agricultural implements and motor cycles.

It is better to have a million dollars coming into the country than the same amount going out. Although some of the wise political economists—particularly the academic ones—may not agree with us, yet why in matters of this kind is not a nation much like an individual? If the individual spends more than he earns or if he pays out more than he takes in, he will soon become impoverished. If a nation imports more than it exports, it will soon become impoverished also.

On the other hand, no matter how much a certain class of a nation spends within the nation, the nation itself becomes no poorer, and no matter how little a certain class spends, the nation itself becomes no richer.

So also, in the matter of foreign trade, if a nation can sell another nation its surplus goods or products and receive in payment goods that it needs, the exchange is a profitable one, even though the export and import trade is evenly balanced.

But the point should not be lost sight of, that neither this nation nor any other can for a long time go on in importing more goods than it exports, no matter how profitable the exchange itself may be, without finally coming to a period when it will have no money to buy with.

It is for this reason that the present balance of trade to this country is so gratifying and important.

Of course this country is handicapped and made poorer by the enormous amount of money spent abroad by American tourists, but we don't see how this can be avoided, or rather how any one can be blamed for it, for it must be admitted that for sight-seeing purposes old countries are far more attractive than new ones. But those who spend money abroad for goods that can be purchased at home are not only just a bit unpatriotic or disloyal to their own country; in the long run they are very short-sighted.

THEY CAME HIGH.

By the way—that set of synthetic rubber tires that were so widely heralded. It is now learned that they cost about \$20,000. This fact is calculated to allay any feelings of apprehension on the part of rubber growers, and incidentally on the part of tire manufacturers. It is generally believed that by the time synthetic rubber comes on the market as a commercial proposition the cost of producing natural rubber will be only half what it is now, and that condition will come about because more and more rubber is being grown all the time, due to the increased number of trees being planted. In the interval tire makers expect that the rubber market will move along undisturbed by the artificial product.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

The competent driver has something else to look after than the roads and the proper care and handling of his own car. He has that menace to automobiling, the reckless individual who may perhaps be expert but yet careless. When such an individual is seen approaching in a car, the only safe course is to keep well into the ditch in passing. The worst of it is, there seems to be no way to avoid him. In case of a collision, his word may be taken at the full value of his victim, and there may be absolutely no evidence save

his testimony against that of the other party. Collisions of passing automobiles seem to be increasing, and there is thus far absolutely no way to prevent them except as stated. When a worthless and drink crazed individual drives a horse, the poor brute himself will usually turn out for an approaching carriage. But the automobile goes just where it is sent.

Accidents seem to be less this month than earlier in the season, probably owing to less driving, but if we were to report a tithe that are reported, there would be no room for anything else in the magazine.

Skidded into a Tree.—In Philadelphia a man and his wife while driving attempted to pass around another vehicle. The car skidded, went over a curb stone and smashed against a tree. The passengers were injured, and in addition to their injuries, were arrested for reckless driving and all taken to a police station.

Car Started by Boys at Play.—In New York City a man lost his life in a peculiar accident. He was underneath his automobile working at the machinery, when a group of lads surrounded another car standing near. Finally a boy touched the lever and another put on the clutch, which threw the gear into action. In an instant it started forward smashing into the stalled car and the man underneath was crushed. He died before he could be taken to a hospital.

Skidded in Muddy Roads.—An automobile containing six persons skidded in the muddy roads near Cohocton, N. Y., and went over an embankment. One of the passengers received a fractured skull and may die. The rest received severe injuries from broken ribs and legs to bruises.

Killed for a Hat.—At Gulfport, Miss., a man's hat was blown off as he was riding in a rapidly moving automobile. He tried to recover it but lost his balance and fell from the car and was killed.

Train Hits a Stalled Car.—Four persons were killed and five injured, two probably fatally, when a fast express train struck an automobile near Pittsburgh, Pa. The driver of the car was signaled at the railroad crossing to stop but was unable to do so until the front wheels ran on to the track. There the engine stalled and all the efforts of frantic bystanders to pull it clear of the rushing train were futile. Two of the passengers were able to alight and escape but the others, including a clergyman and his son, were killed.

Gets Confused on the Road.—A young woman in St. Louis, Mo., was knocked down and seriously injured by an automobile while walking with a company of other girls. She had just taken the hand of a companion but was undecided which way to go when the automobile came upon her. In her confusion she dodged first this way and then that, and the driver of the car was unable to avoid running her down. She was knocked unconscious and taken to the hospital. Singularly enough when the driver of the car was making repairs on his automobile, incident to this accident, the car started suddenly and his clothing was caught in the chain. It was torn from his body and his arms, shoulders and chest, were painfully bruised and lacerated.

Two Cars in a Collision.—In Gloversville, N. Y., two automobiles being driven at a fair rate of speed took a head-on collision. Neither driver saw the other car until they reached the corner where they came together. As is usual in such cases, the small and light car got the worst of the smash-up but they

were both very seriously damaged. The passengers were bruised and shocked but strange to say not seriously injured.

Skidded into a Train.—Near Paterson, N. J., a skidding automobile slid thirty feet into the side of an express train at an unprotected grade crossing. One of the two occupants of the car were killed instantly. The other had both shoulder blades broken and sustained injuries from which he will not soon recover.

Had a Premonition.—Relatives of nine young men who were killed in Philadelphia declare they had a premonition of the impending disaster and there is no reason why they should not have had one. It appears that they spent the evening in various cafés and saloons and the car was a new one that the driver had not completely mastered. Nine young men were in it and six others were in a smaller automobile when the party came at a terrific speed down the street. They were about half way over a bridge that spans the tracks of a railroad when the car swerved and the front of it hit another automobile which was going slowly. The automobile shot into the air and turning over cleared the railing of the viaduct and fell to the ground 58 feet below. There was no outcry from any one and it was evident that the deaths of the nine young men must have been instantaneous.

While on Her Way to College.—A fifteen year old girl was being taken by her father and mother to a college near Stilesville, Ind., when the machine skidded and turned over on a fifteen-foot embankment. The girl, her mother and the driver were pinned under the car but the father was thrown clear of the machine. He was, however, forced to stand helplessly by and see his only child die while his wife and the driver were pleading for him to rescue them from under the car. He tried to lift the car from them but it was too heavy, and when his strength gave out could do nothing but run for assistance. When he returned his daughter was dead and his wife and the driver seriously injured.

A Car Turns Turtle.—A merchant from Toronto, Canada, was killed at Schenectady, N. Y., when his automobile ran into a rut at the side of the road and turned turtle. This is a brief statement but it should mean a whole lot to car drivers who are not always aware of the dangers in striking deep ruts in the road.

Ran Down by a Trolley Car.—Six persons were killed in a big automobile near Dallas, Texas, it having been struck by a trolley car traveling at a rapid rate of speed. It hit the automobile squarely in the middle throwing its six occupants directly in its path and making a frightful wreck, with death and all its attending horrors.

Road Experiences.

From Louis C. Greene, Iowa.—When I was out riding one day I came across a stranded car. I stopped and asked if I could be of any use. If I come across an autoist in trouble I always offer my services. He was out of gasoline. I took a couple of quarts out of my tank and put in his. He was two miles from town and that would take him where he could buy it.

It was not long till I came across another stranded car. This was on the River to River road where autos are plenty. The man was red in the face from cranking the engine. It would make a dozen explosions or so and stop. I examined the vibrators. They were all right. I asked if he was sure of plenty of gasoline in the tank. He was sure. "Then," I says, "there is some foreign

substance in the carburetor that has stopped the flow of gasoline." Could I remedy it? I would try if he would trust me to. "Go ahead; you can't make it any worse," said he. So I opened the needle valve five turns. He cranked the engine, which started all right but choked before I could turn the needle valve back again. I soon had that right where I found it and the engine cranked easily and quickly settled down to business. He rode away with a big smile on.

The next was a car under a shade tree by the roadside with a bursted tire. I offered my services and he said they were greatly needed. He did not have any blow-out patches. I had a new set of tires and my blow-out outfit was at home as I did not think it was needed. I went to a farm house near by, got a grain sack and about twelve feet of quarter inch rope. He had an extra tube. With the grain sack I fixed him up with blow-out patches, put the tire in place wrapped the rope close and tight around the tire over the crippled place, and put in the usual amount of wind. The tire was then good for fifty or a hundred miles, and before that time he would be where he could get needed repairs.

Next was a gasoline wood sawing outfit that had balked. The man came out to the road and stopped me, thinking he might get some batteries as his were exhausted and his sparker was crippled. It was a standard make and I proposed examining it a little. He objected saying he was going to take it to the city next day where they fixed such things, but with a little talk I got the privilege of examination, and found that one of the carbon brushes was stuck in its case and we could not get it out. I filed a little hole in corner of the case and with a hatpin pushed the brush out and trimmed it off a little. They had the engine pretty well flooded and we could not start it, so I took battery off my car, wired it on, and the engine started readily. I then switched on the auto sparker and took off my battery. I stopped the engine, and the next trial it started all right on the sparker and his troubles were at an end for a time.

Well, this was more doctoring than joy riding, but I enjoyed it. I would not make any charges for my assistance, but every one insisted that I take something, so for fear of more hindrances and that Mrs Greene and I would be late for supper we took a back road for home.

In a few days our village got up a big run which took near a day. I traveled at the rear as the hospital car, loaded with many things that might be needed to keep any crippled cars going. There were twenty-two cars in the procession and not once was I needed all day.

ACCUMULATOR TROUBLES.

How They May Be Detected and How They May Be Best Remedied.

Accumulator or battery troubles are not as common as they once were, for there has been improvement in the construction of these devices as well as in other automobile accessories, but they still exist, and it is well enough to know what are the more common and how they may be diagnosed and remedied. If anything is wrong with the case it is usually recognizable by the abundance of the acid present in the carrying box, which cannot be accounted for by accidental spilling and the like. It is usual to assume accumulator cases to be constructed of celluloid, although in some instances one finds those who prefer glass and ebonite submerged under a more than adequate quantity of black wax, and in some cases even pitch. It is not intended to prejudice intending purchasers against these very excellent cells, which possess many points of superiority but those unacquainted with storage

cells are urged not to favor ebonite cells. X rays have been used in regard to single two-volt cells to reveal more than meets the eye—in fact, the writer once discovered a considerable quantity of sediment that was causing an internal short-circuit, i.e., the condition existing when the electricity passes through the plates, instead of through the coil or lights, as the case may be. This type of accumulator does not lend itself to easy treatment, as it is difficult to make a satisfactory repair to glass or ebonite cells, although a small leak in an ebonite or glass case can be patched up for a time.

The commonest failing that the celluloid cells have is the splitting of the top corners, or the partial detachment of the lids from the sides after prolonged usage as shown at E at the top of Fig. 1. After this in frequency would be placed that distressing malady known as corner leakage, which takes place at the bottom of the cells at C, which, although it does not extend along the seam or side as in the case of the split occurring at the top, is very troublesome for three reasons. Firstly, it is difficult to repair, owing to the sedimental deposit which accumu-

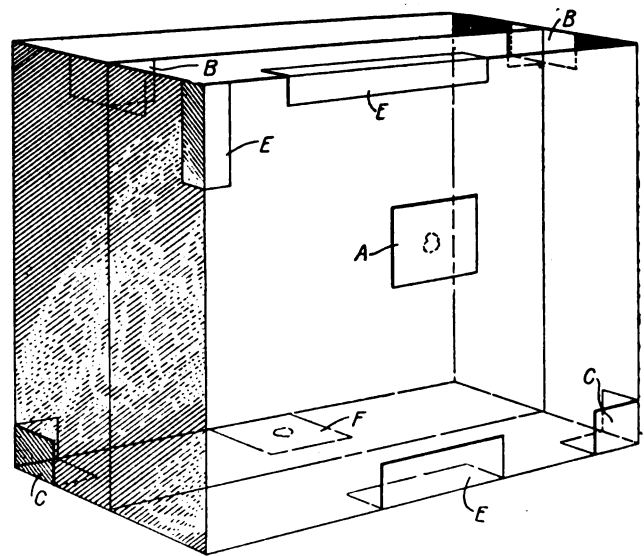


Fig. 1.

lates at the base of the case, and the difficulty of getting rid of this by washing and shaking out, without dismantling the entire battery. Secondly, the difficulty experienced in cleaning such a place, and rendering it free from moisture; and, lastly, the danger of firing is by no means negligible, as it is a common practice to "charge up" on a lead-covered bench, which may accidentally or otherwise be connected to the supply current on one pole (or one side of the charging main). Many things may cause such a condition, but in all cases the result is that the electricity finds a way of escaping from the terminals to the bench by the way of the leak in the battery case, and in doing so will not infrequently burn a hole in the celluloid adjacent to the aperture. This burning can be readily detected by the smell characteristic of burning celluloid, and the white smoke which attends this rather slow combustion. In very old accumulators an actual leak is not necessary, as the decomposed condition of the celluloid, coupled with the more or less metallic sediment found at the bottom of the case inside (and not infrequently outside as well), will, if charged off a very high voltage, cause a firing as previously stated, since the celluloid is little better than a bad blotting paper, and so acts as a fair conductor. This may even take place in the middle of the case, quite away from the corners, as at F in Fig. 1. In repairing such a leak it is necessary to scrape the celluloid well with a

sharp knife, even though the hole has to be greatly enlarged, as all traces of fired material must be removed to make a good repair.

The next leak in order to frequency is the partition trouble, where either side (or both, for that matter) cleaves away from the case, as is indicated by B in Fig. 1. Fortunately, this troublesome feature rarely occurs at the bottom, but in any case it is always necessary to remove the interior to get at the seat of the trouble, as the mere removal of the lid does not allow of sufficient latitude for patching. The last, and generally least, common fault is that of a slight puncture in a really convenient place; some such a position as denoted by A. This hole could only be caused by careless handling.

There should be little difficulty in finding by inspection the exact position of an external leak. Carefully wipe

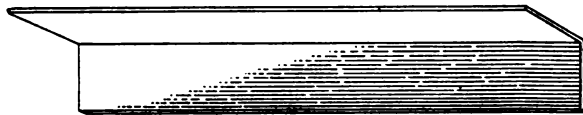


Fig. 2.

all traces of acid from the surface of the case, and stand it on a piece of clean, white notepaper. If, after waiting a few minutes, no discoloration is visible upon the paper, it will clearly prove that the bottom at least is sound. Upon glancing at the sides and edges, one will in all probability notice a stream of acid globules slowly descending towards the bottom of the case; its source should be carefully marked. In the case of the paper test, the source of leakage will in most cases, be sufficiently well indicated by the slight discoloration or moist place upon the paper, and by looking at the corresponding portion of the accumulator case the leak should be found quite readily, although it is to be admitted these minute leaks are troublesome to locate exactly.

Before attempting to repair the leak, minute though it may be, it is absolutely necessary to empty out the acid of both cells, unless it is possible to separate the cells from each other (as would be the case of two volt cells joined up by means of a detachable connection strip), and, further, it is essential to get rid of acid traces by means of rinsing out the faulty cell with water. In the case of a double cell, do not add water to the undamaged side unless it is to stand empty for some time—merely replace the vent plug or stopper to exclude the free passage of air; the reason for this is that water may induce sulphation.

Assuming that all traces of acid have been got rid of in the rinsing process, the next operation is to stand the case in the most convenient position for draining, and for allowing the faulty area to dry. When this has been accomplished, steep a piece of clean ray in gasoline, and rub the damaged portion with it, in order to remove all grease and other impurities which so readily cling to celluloid. The place will now be ready for solutioning with a moderately thin solution of celluloid. The neighborhood of the leak, and a patch of clear celluloid the required size, should be treated with the solution, applied with a good quality camel-hair brush. A cheap brush will shed hairs, and the paint upon its stalk will dissolve into the solution, thereby reducing its uniting properties. At the earliest possible moment, place the patch upon the prepared place, and hold it there, pressing it sufficiently hard against the case to exclude the air; this will be determined by the solution spreading evenly between the case and the patch. It is, however, good practice to brush an external coating of solution over the repair, also previously to bevel the edges of patches on

the outside, so that in the event of their catching against anything, they will be less likely to split off than if the edges were left square. The foregoing only applies to thick patches, such as those used for partition work, as at B in Fig. 1, which should be 1-32 inch thick at least, as they have to stand a considerable amount of wear and stress. The best material for small leaks and splits, also binders, is the thin patching celluloid.

To repair a leak at the top edges, it is necessary to observe all the preceding precautions, and to use a patch such as shown in Fig. 2, taking the greatest care that it fits flat against the side, and is of a sufficient length to counteract any tendency of the case to split along the sides. The patch shown in Fig. 3 is for the repair of the bottom corners, and needs to be cut from thick sheet celluloid to the shape indicated in the developed view and bent along the dotted lines; the result will be a corner piece suitable for the portion of the case in question. For all bending operations the celluloid should be immersed in hot water, as by so doing the celluloid is rendered pliable. When the correct bend is produced, it can be fixed thus by dipping the celluloid into cold water. It is necessary to solution the two sides of the corner patch that come together in the folding process, and to secure them by means of a piece of string, or a clamp. When set, the join should be once more gone over with the solution, to make certain there are no minute air holes, etc. When the patch has thus been prepared, the corner of the case should be carefully cleaned, the solution applied to it, and then the patch. Immediately this has been put on, the corner should be held in position and secured by string or clamps. Should there be any gap, it must be persuaded to close up by means of a little more solution, and the application of a sufficiently heavy weight to effect that end.

It often happens that the sides of the case show a tendency to split away from the lids; this can easily be re-

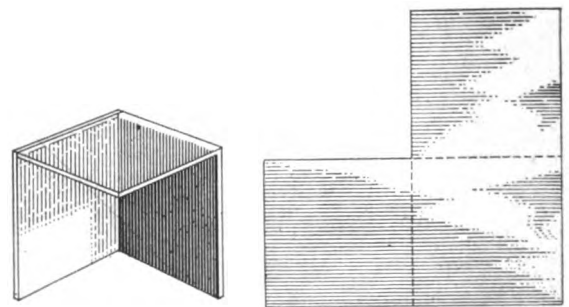


Fig. 3.

paired by means of solutioning the faulty side in line with the edge of the lid, also treating the edge of the lid adjacent to the side in like manner. The lid and sides should then be pressed together, and secured in position with a clamp or weight; even a few turns of string tied round the top will answer admirably if little wooden wedges are inserted between the string and the sides of the case, in such a position that they afford their extra pressure just at the desired points. This wedging system is to be commended for its simplicity, and for the local nature of its application, thereby doing the least damage to other portions of the case, which too often suffer under other methods of manipulation. It is sometimes advisable to supplement even a sound reunion of case and lid accomplished as above, by the addition of an angle binder, such as shown in Fig 2, cemented all round the top of the case, and some makers even start the battery upon its career thus protected; only the makers, of course, give it a more artistic appearance than is possible under first aid treatment, for the binding celluloid

which it is most convenient for the amateur repairer to employ sometimes withers a little under the influence of the solution. To make a presentable job of the foregoing, it is essential to use wooden angle pieces to keep the patch quite flat. These wooden angle pieces can be readily constructed out of two strips of smooth wood $\frac{3}{4}$ inch to one inch wide by $\frac{3}{8}$ inch in thickness, the side of one strip nailed or screwed to the edge of the other, and cut to the length of the sides under repair. The angle pieces are held in position by means of several turns of stout string, augmented with the wedges previously alluded to. If it be desired to mend more than two sides at once, two smaller pieces of the angle wood will be needed for the sides of the case, of such a length that they will not obstruct the clamps already in position. These angle pieces can be used to advantage on the vertical sides for securing a patch as at E in Fig. 1. Another use that the wooden angle pieces can be put to is to aid the drying process, for by rubbing them quickly to and fro over a patch, the friction set up will assist the solution to evaporate also it causes a refractory patch to conform to the shape of the case.

It may save unnecessary trouble to mention that it is possible to repair defective lids and the like without disturbing the acid in the battery, but what is saved in trouble is often lost in efficiency.

AMERICAN CARS ABROAD.

Selling Rapidly and Somewhat Alarming British Manufacturers.

From Consul General John L. Griffiths, London.—The brilliant success which has attended the introduction of American motor cars on the British market is strongly reflected in an article in one of the London newspapers in which it was recently stated that a traveler on an automobile journey from the north of England to London reported that a very large number of cars were met, and that two out of three were low-priced American cars.

In the last three or four years there has been a wide English demand for low-priced American cars, and the demand is growing notwithstanding an earnest effort to check it. The results secured by American manufacturers of inexpensive motor cars are largely due, it is claimed by their British competitors, to the enormous output of automobile factories in the United States in comparison with the small number built in Great Britain. British manufacturers confine themselves principally to the more expensive type of car. The users of the inexpensive American cars say they find them more economical, even if they have not so long a life, than cars which cost several times as much and which must rapidly deteriorate in value. The great majority of people, too, can not afford to buy the higher-priced cars.

Interviews with leading British representatives of the motor-car industry show the great extent to which light American cars are being sold in England, and in the British colonies. The statement was made not long ago that American cars were "selling in hundreds; they are cheap and powerful, and British makers must recognize the form of car in which competition must be met. A group of manufacturers should get together for the purpose of producing an English car which would compete with the American."

American makers advertise considerably in the widely circulated daily newspapers of the United Kingdom. One American firm not long ago had a full front-page advertisement in one of the great London daily newspapers, the cost of which for one insertion would amount to about \$1,500, or very nearly the selling cost of two of

its cars. This method of advertising is found to be very effective. Conspicuous posters are also to be seen in railway stations, and in the underground railway passages. Traveling agents are being employed extensively, and indeed no means is neglected to present the American car to the English public to the very best advantage. Large supply stores have been opened in London, so that needed parts may be promptly furnished.

It is rumored that a two-seated runabout of American manufacture will be placed on the English market soon to sell for about \$250. The car will carry two persons. It is to be introduced to compete with motor cycles having side-car attachments which now sell at approximately the same price. The field for such a car would doubtless be very large, as it would be within the reach of thousands who cannot buy even the cheapest car now offered. It is also promised by American manufacturers that a four-seated, or family car, which would sell for \$500 will soon be introduced on the English market.

That certain British firms are already endeavoring to meet the competition from the United States is very evident. One of the latest types of British makes is a two-seated car selling for \$705, which is said to be capable of developing a speed of 28 to 30 miles per hour, with low gasoline consumption. The single-cylinder engine has a rotary sleeve operating the intake and exhaust ports, driven by skew gearing from a shaft which is driven by a silent chain from the crank shaft; extensions of the shaft drive, the armature of the magneto and the oil pump contained in the oil reservoir on the dashboard. The interior of the sleeve is 80 millimeters (3.15 inches) in the bore, while the piston travel is 160 millimeters (6.3 inches). The wheels are of wood, shod with clincher tires of 700 by 65 millimeters (27.56 by 2.56 inches), and fitted with strong brakes.

Notwithstanding the developing competition there is no good reason why there should be any falling off in the sale of American cars on the English market, provided the present high standard is maintained, and indeed there are many reasons why the sales should increase.

A British automobile engineer who has recently returned from a tour of inspection of motor-car factories in the United States is reported to have said that the American car is not the result either of cheap labor or cheap materials, and that it is of excellent quality. There was a time when it was customary to speak in deprecatory terms of the American low-priced car, but it has been on the English market long enough to completely demonstrate its good qualities and is now in use by so many well-satisfied purchasers that criticism of this character has lost all its significance.

The following extracts from the London Times of August 20, in an article from a correspondent on the "Coming of the Cheap Car," give an excellent idea of the fine impression which the American low-priced motor car has made in the United Kingdom. After claiming certain advantages for the higher grade of English-made cars and also of moderately priced motor cars, ranging in value between \$1,460 and \$2,433, attention is called to the inferior position occupied by the British manufacturer with regard to the cheaper cars:

"It would be invidious to mention particular makes in this article, but it may be said, generally, that the cheap British-made car is now enduring a good deal of effective competition from America, France, Germany and Belgium, and that it will have to improve or endure a great deal more serious competition in future. To take one instance—there are cars made in the United States, some by tens of thousands and some by hundreds of thousands a year, which in the opinion of the writer are, for quality and price combined, as yet unapproached by any British manufacturer. This may be an unpalatable statement

to some of the English manufacturers of this type, but it can hardly be denied that the competition of the American cheap car is only just beginning; that the old accusations of want of reliability, durability, and lack of finish are disadvantages which are more theoretical than actual, nowadays; and that the majority of cheap American and French cars to-day are much better than those of a year or two ago, being quite equal in all essential features to the so-called cheap British-made car.

"To put it bluntly, the fact is that there is no firm at present which has been sufficiently enterprising to lay down a large enough plant to manufacture small cars in sufficient numbers to make their production really cheap. There has also been a want of commercial ability in that, while in most cases the American cheap car is sold ready for the road, the British car is too often sold incomplete, being unprovided with headlights, hood, speedometer, and other accessories (either some or all), which have now become actual necessities. It is curious that, though some attempts have been made from time to time in this country to produce small cheap cars, costing, say between \$500 and \$1000, failure has too often attended these efforts either from lack of bold advertising or of proper commercial or engineering management. As every autumn show comes we see announced in the press attractive small cars of British manufacture, but the promises are rarely equaled by the performances. In short, this branch of the automobile industry has hitherto been avoided by big firms, possibly on good financial grounds, and has not received sufficient attention from those who have actually taken it up.

It is hard to say how many persons there are in this country who would buy a really good cheap motor car, sold, say, at \$600, but if such could be obtained probably as many new motorists would be added to the automobile community as exist to-day, or some 250,000."

Growing Demand in England for Cheap Car.

The editor of *Motor*, in a communication to the *London Express* recently, wrote: In England our largest output of cars is probably only one-fortieth that of the correspondingly largest American firm. In fact, this handicap is such as to make competition in prices by any single English automobile concern an impossibility. The situation is undoubtedly a serious one at the present moment. It may be found to be infinitely more serious in the near future. The demand for the type of car which America is sending us has existed for some time and is growing every day. Further, a demand for an even cheaper car is only awaiting the arrival of the right vehicle at the right price.

British makers have always regarded the small cheap car as more or less of a side line and have concentrated their energies on the medium and high-priced vehicles, while America has specialized on the cheap popular production. Those who get about on the roads of the country, however, are impressed more than ever this year by the enormous number of side-car machines—that is, motor bicycles having side-car attachments. It must be obvious that such a machine is only a compromise and that those who use it would prefer a light car if it were available at the price they can afford.

Car lamps that have been exposed to the weather and have gathered a coating of verdigris, may be cleaned in a simple manner. Take equal portions of good metal polish and wood alcohol, apply with a brush and allow to dry. When dry rub with a clean cloth and the verdigris will rub off, leaving a clean smooth surface. The lamp may then be polished in the usual way.

THE TERM "BACKFIRING."

Two Meanings Applicable to the Word and What They Are.

From H. A. B., in *London Motor*.—There are two meanings applicable to the term "back-fire." The most general one, and the one which the writer contends is wrong, is to assume it means a reverse stroke of the starting handle. "Back-stroke" would be more correct and expressive. A real "back-fire" occurs when the incoming or a residual charge ignites in the inlet pipe, giving rise to a distinctive banging noise, accompanied by the emission of flame or smoke at the air ports of the carburetor; this occurs in the worst cases of back-firing—when the trouble is less serious only an occasional "pop" will be heard. What is the cause of it? Some motorists are greatly puzzled by it, and it does not enlighten them much to be told that it is "weak mixture." This, in fact, is the prime reason, but there are several other lesser factors which contribute to it. These include the particular setting of the valves adopted and the adjustment of the carburetor.

There is a system of setting the valves, now a good deal adopted, which is best explained as "overlapping." The exhaust valve will have the usual amount of "lead" on the firing stroke, but will remain open for a little while on the next down or inlet stroke; that is, it will close "late" instead of exactly on the dead center. The inlet valve will be timed to open either a shade before, or exactly on the dead center, so that what happens is that both valves are open simultaneously for a very short period of time. If it now happens that the mixture is weakened considerably—if the carburetor be not set to the best adjustment the act of throttling down will weaken the charge—such weak mixture will burn relatively very slowly as compared with a properly proportioned mixture, and the combustion is going on during the exhaust stroke, that is, it is still burning when the inlet valve opens, and as this burning residue is at considerable pressure above atmosphere some of it will have a strong tendency to rush out through the inlet valve, and as there will be some mixture in the inlet pipe at atmospheric pressure it is bound to ignite when the flame of the previous slow-burning charge comes into contact with it.

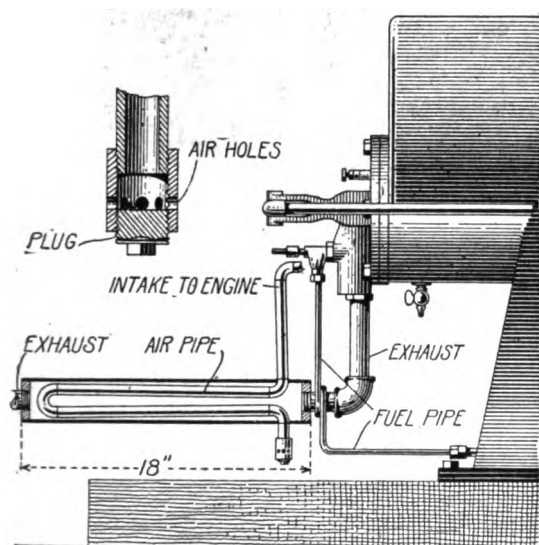
But it does not necessarily follow that "popping" will only happen if the exhaust valve be open during the beginning of the inlet stroke. It may occur if the valve be timed to shut "dead" on conclusion of the exhaust stroke. It all depends on how the previously-exploded charge has burnt. If it has been consumed very slowly then it is as likely as not that flaming gas will "hang about" the exhaust and inlet ports and ignite the incoming charge. A theory the writer has heard put forward is that firing back is mostly caused by flaming exhaust gas being sucked into the cylinder on the induction stroke, through the timing being all wrong, or the spring of the exhaust valve being weakened to such an extent that it opened on the induction stroke. If there be anything in this theory it could only apply to engines fitted with the now discarded automatic inlet valve. In the case of a mechanically-opened valve there would be practically no atmospheric pressure tending to push the exhaust valve off its seating. The first step towards eliminating back firing is to effect such adjustments to the carburetor as will result in a richer mixture being obtained at slow speeds.

The general adoption of adjustable valve tappets nowadays is a feature to be commended as it enables all the valves to be set for opening period equally as to tappet

clearance for expansion of the stem under heat, and independently of small variations in the length of the valve stems or discrepancies in the amount of lift which may arise from grinding-in operations. It must not be concluded, however, that adjustment of the tappets is everything in the working of the valves. The condition of the cams is more important still, but it is not easy to know what this condition is, as the camshaft is so well cased in. Any wear of the cam profile, of course, must seriously affect the valve timing. The writer has, from time to time, come across badly worn cams on some of the earlier pattern cars, and it has struck him that it would not be an impossibility to make the cam profile easily renewable, instead of having to fit a complete new shaft, where one-piece construction is adopted, or to fit a complete cam. The point is that valve cam renewals on early pattern cars is usually found to cost a disproportionately large sum.

Kerosene in a Gasoline Engine.

Although the same conditions do not apply, and of course kerosene could not be used for fuel by the method mentioned in an automobile motor, yet it may be interesting to know how one man changed his 10 horse power



Changes necessary to use kerosene fuel.

stationary gasoline engine so he could run it with kerosene. He says:

There are three things to accomplish or change. First, it is necessary to heat the air at the intake; second, heat the filler; third, take in a spray of water with the fuel. I enclose a drawing and will try to explain how we fixed our engine. To heat the air, we take a piece of pipe about eighteen inches long by twice the size of the exhaust pipe of the engine. Plug the ends and fit in the couplings so as to connect direct to the exhaust pipe. Then we pull the air for the engine through this chamber by means of a small air pipe entering near one end and passing the full length of the chamber and back, and then out on the opposite side at the end as shown in the illustration. Connect coupling with holes drilled in it, and insert the plug to adjust the air when starting. By this method, the air is heated by the hot exhaust and at the same time we get fresh, pure air. To heat the fuel, we wrap the fuel pipe once or twice around the outside of the exhaust pipe. To get the spray of water, run the pipe into the engine hopper, and by using a needle valve, you can regulate the drop into a little funnel opening into the intake pipe near the engine. The object of the fun-

nel enables the operator to see how much water the engine is taking. We used the bottom of a hand oil cup for the funnel. The air pipe can be reduced down to about one-third the size of the intake pipe as used for gasoline. As kerosene is harder to vaporize than gasoline, it is necessary to give the engine more suction at the intake pipe. We find it is advisable to heat both the air and funnel. Of course, we have to start our engine on gasoline and run it a few minutes until the engine gets hot. The spray of water helps to break up the carbon deposit. It also stops the explosion knocks. You will notice, there will be a violent knocking at each explosion, if the water is not used. In starting, it is well to shut off the air partially and let the suction be hard until the engine becomes hot. Then open it up again.

CARE FOR THE PAINT.

How to Preserve and Protect the Body Finish of the Car.

From M. C. Hillick, Pennsylvania.—To the car owner, the preservation of the finish is a matter of importance. After paying a substantial sum for the development of the finish it is of the utmost concern that, so far as possible, it be maintained intact for the maximum limit. The steel or metal surface is one that requires constant attention while the car is in service. Any fracture of the finish that opens up the film of paint and varnish to the extent of letting the weather and moisture assail the bare surface of the metal, is quite certain to get the entire finish in trouble. Moisture is an arch enemy of the metal surface, and particularly of the steel surface, and this fact is alone sufficient to urge upon everybody concerned the necessity of watching the surface closely for the slightest break in the film of protective material. As soon as this occurs the fracture should be given immediate attention. Coat over the break with a good paint containing enough oil to bind it all hard and fast to the surface. If a deep fracture, after the touch-up pigment has dried securely, bring it up with hard drying putty, sandpaper in due season, coat over with the color to match the regular body color, and slick over with varnish to bring out the finish in good order. This sort of inspection and surface repair work will save the car owner, no small sum in the course of a season or two in addition to giving him a better and neater looking car right along.

The car with the steel surface is now under the present practice of painting and finishing sand blasted previous to coating with paint; which treatment serves to remove all rust and scale. This is the only effective method of removing the rust and scale formation outside of pickling the metal in dilute muriatic acid in a vat. This latter method, however, is not available for ordinary work. Nevertheless, this one thing is certain in connection with all metal surfaces, namely, rust and scale must be prevented, or removed, if the surface is to endure and serve the purpose for which it was manufactured. The steel surface, if not painted, will deteriorate at the rate of about 3 ounces per square foot, it is said. In the absence of the sand blast, steel wire brushes are used with considerable success. After using the steel brush, wash the affected parts with benzine, and then proceed to coat it and finish as above advised.

During the autumn months the car will need, and should receive, extra attention and care. It is a trying season on the varnish. Mud and road refuse, harsh rains and sleet, and a combination of other destructive conditions all unite to work swift destruction upon the var-

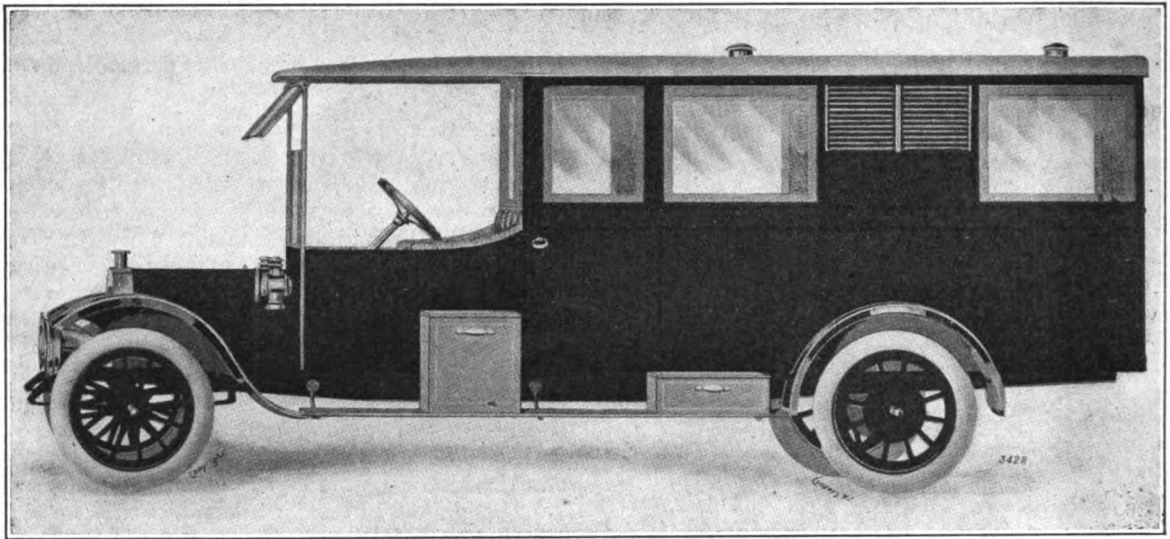
nish unless the car user interposes certain saving remedies, such as, for example, frequent washing with water from which the chill has been taken. Mud should not be left upon the car to dry. During this process of drying the life of the varnish is extracted causing loss of lustre, spotting and various other unfavorable changes in the appearance of the finish.

As long as the high lustre of the varnish is maintained and it responds like a new garment to all the exacting requirements of service, a simple washing with clean water, after use upon the highway, will suffice; but once the varnish begins to lose its high, sharp lustre, and water fails to bring back the brilliancy of youth, then comes the time when the use of a proper renovator is warranted. Of renovators, apparently there is no end,

A Car for Sick Children.

The illustration shows a car used by the city of London for carrying ill children. It will take 24 children and a nurse. There is a side entrance in addition to the rear entrance of double doors. The sides are each fitted with three lights, the upper portion of the center panel being filled with louvres for ventilation, in addition to those in the roof. The driver is well protected with high wind doors and standard wind-screen and jointed top half, folding either way. Large capacity tool boxes are fitted on the platforms, the front one being fitted in partly under the driver's seat.

The chassis is a 15 horse power Napier, with a long wheel-base, suitable for the type of body, and it has a long frame extending well behind the rear wheels to



Used as a City Ambulance for Children.

but of those adapted for use upon the fine finish of the automobile there is, after all, no plentiful supply. The renovator should be essentially non-drying; it should not produce a film on the finish in a warm room; it should fetch out the dormant life and richness of the varnish. It should, moreover, act as a food for the varnish, giving to it nourishment and life, and new buoyancy, and length of days.

Autumn weather may well suggest to the car owner the need perhaps of a fresh coat of varnish for the surface. If the varnish, during the summer, has worn dry and thin and is giving to the colors and the supporting coats an inadequate measure of protection, then it were economy to put on at least one good, full coat of varnish to hold the surface strong and intact during the winter. It costs money to work up a nice, well-balanced surface of paint and color, and it does not pay to forego the protection of a new coat of varnish when that coat is urgently needed. This is necessary even though it is not expected that the car will be often used during the winter months. The undercoats, and notably the delicate coats of color, need ample varnish protection during the car's days of idleness in the garage. Often a freshly applied coat of varnish in October or November will pay for itself before spring through the protection it affords the color and the undercoats.

If a tire bursts and car turns turtle, it is almost invariably due to negligence or want of care as to speed. At a safe speed a tire may burst and the car will not leave the road or turn over.

support the overhang of the body, without unduly increasing the weight of the framing timber.

An Instructive Experience.

From W. Robinson, Ohio.—May I relate a peculiar occurrence that befell me some time ago? It may, or may not, help some one else, but it taught me a lot.

I was helping a friend make some repairs on his car one day, and as we had planned to make an early start on a trip next day, we worked right on into the night to finish up. Then we took the car out on the road to try it out. We had gone about 1½ miles, and found everything just right, and decided to go home again. The road was narrow and we had some backing to do, and you can imagine our surprise when we found that in low gear or reverse the engine died down before it could move the car three feet. All indications were that the mixture was too poor, but running light the carburetor adjustment was right. We adjusted and adjusted, but just as soon as the clutch was let in the car made slight effort to move. Then the engine stopped. We spent two solid hours examining everything we could think of that might cause the trouble, but to no avail. Finally we turned it around by hand and set the carburetor the best we could. Then my friend started the engine and let it run slowly for several minutes. It seemed to be just the same as before, so he set the gears in high (it is a two speed car) and with the clutch out, I, and another man who was along, pushed until the car was going pretty fast. Then the driver let in the clutch and

away we went. The car ran beautifully and we were soon home.

Of course, we gave up our trip to hunt that trouble. My friend drove down to my house next day and said he had had no trouble at all in starting, but at my house we had as much as the night before. So we began to think. (Something we might have done before.) Then I opened the hood on the carburetor side, and we tried to start, and so soon as the engine stopped, I ran to the carburetor and looked at it. There was the trouble right there. There was no gasoline in the float chamber. The investigation showed a bend in the pipe to the tank that prevented gasoline enough passing to give the engine power to move the car, but it let it past fast enough to run the engine fast light. The starting at his house was down hill, and that was why he had no trouble there.

While I am writing let me mention one or two other things. In the winter I remember seeing in The Automobile Dealer and Repairer how one man was troubled with the porcelains breaking on his plugs. They are apt to do that if screwed in tight when the engine is cold. If, in replacing, a little grease is smeared on the plug threads and then the plug is screwed in while the engine is hot, the trouble will most likely disappear.

Also, don't use rawhide for a fan belt. There is nothing but stretch to it and it does not hold well anyway. Because the fan runs don't believe it is running as it should. Start the engine, raise the hood, stop the engine, and watch the fan. If it runs after the engine stops the belt is too loose.

Wheel Twisters in Porto Rico.

From C. B. Emerson, Porto Rico.—What is the difference between a "wheel twister" and a chauffeur? Reply.—A chauffeur should know something. A wheel twister doesn't know anything.

As to daily practice, I was called to examine a car that had just had its crank case and transmission case cleaned thoroughly and the right amount of good oil put into the same. Wishing to make a trip, the owner found it impossible to turn the motor over, so after ten minutes of guessing he sent for a local "expert wheel twister" to solve the trouble and he brought an "associate" to help him. They pondered and experted for two hours, then the owner telephoned for me from a distance which involved a fee of \$10 for the trip aside from the expense of such repairs as might be needed. The experts decided that the "cylinders were seized." It was evident that something was very much seized. After asking some pointed questions of the owner and of the man who oiled up, I came to the conclusion that it was possible that some fool had with a big wrench screwed the $\frac{3}{4}$ inch drip plug in the transmission case far enough in to act as a set screw against the enclosed flywheel. To prove this I gave a half turn back on the plug and the motor was released and ran as sweetly as could be asked. The owner paid me my \$10 fee (with a very red face) and asked me to excuse him for calling me for such a foolish reason, but I assured him that he need not feel badly about it as he ought to be thankful his motor was all right and I was glad, for his sake, that all was in working order. I immediately wrote to the makers suggesting that they put a "fool proof" shoulder on their plugs with a leather washer to make it oil tight. They thanked me and have adopted the idea.

Another call brought me to a car stalled on the road

three miles from anywhere. This proved to be the simple trouble of a wire broken at the connection with the battery system. It cost the owner \$6 for the trip, but he found out what was the reason of his stopping. He has discharged the "wheel twister" and is now running the car himself after a few lessons for which he paid me \$10. Fortunately he has had no trouble since.

Another case was that of a new 22 h.p. motor car stalled, but within telephone call to me. It proved to be what this "wheel twister" called a "knock." Upon examination I found the "knock" came from four connecting rods that had their metal melted out and I found it in "fine shot" form in the cover of the crank case—everything had been hot. The answer given relative to such treatment of a machine was that he thought the manufacturers had arrangements for oiling their cars automatically! I jacked up the front end high enough to back my repair car to position and after fastening securely, trailed the disabled one on its rear wheels to my place and sent for the parts needed.

Another case of "my gears are so they won't mesh" proved to be a clutch spider with its hub revolving against the ends of what was left of the arms of the spider. The clutch could not be released and the gears would not enter, and fortunately they were in shape for future work.

Later I will send you a photograph and description of my *cucu vano* (Vanishing Ghost) which is a two ton truck fitted up for my traveling office, hotel and repair shop combined. A very useful possession in this country, as one can readily combine the "know-how" with the "get there" with much saving of time.

The reason for my success in this field is that I do not "know it all" and never expect to.

I may say that I have repaired twenty-two different makes of cars and trucks on this island during the last three years. In 1880 I built a steam carriage which I was cursed for having made and threatened with arrest if I ever dared run it on the streets of the city, which I did from 12 o'clock midnight to 3 o'clock in the morning by paying "a secret service" to the policeman on night duty.

Old Casings as Covers.

From Albert Cantable, New York.—In regard to the double tread wire question in the Automobile Dealer and Repairer, which was published last month, I think that when you consider the cost of special rims, also that such a combination of casings on shoes, would generate a great deal of heat while running that no advantage would be obtained. The generation of heat when running, as you know, would naturally cause chafing also and chafing always results in blow outs. The practice would therefore not be economical nor be immune from objections.

Small grains of sharp sand, even a very few, will scratch and score an inner tube if left in the casing, and sometimes will work clear through and produce a leak. Before inserting an inner tube it is important that the inside of the casing be carefully wiped out with a damp cloth.

A vast majority of the States now have on their statute books what has come to be known as the "standard motor vehicle lighting law," which calls for the display of two white lights on the front of the car and one red lamp on the rear.

The New Detroit Model.

Among the more attractive propositions this year of a high-class car at a low price, that of the Detroit, made by the Briggs-Detroit Company, Detroit, Michigan, is an extremely promising one. It is an attractive looking straight-line automobile with a long stroke motor, multiple disc clutch, full-floating rear axle, platform rear springs, left-hand drive and center control. It will be generally admitted that these are features of the most up-to-date sort and no matter what may be the price of a car, nothing has yet been devised that can be considered superior. The Detroit is a roomy car with plenty of space for five passengers. The body is handsomely finished and the upholstery is deep with a high grade of leather. Taken altogether it is a car of extremely high-class appearance and yet the price is but \$850.

The following are the specifications:

Wheel-base—104 inches, gauge 56 inches.

Power plant—Unit type, completely enclosed.

Motor—Four cylinder, cast enbloc, $3\frac{3}{8}$ inch bore, $4\frac{3}{4}$

Wheels—Heavy artillery type, equipped with $32 \times 3\frac{1}{2}$ inch tires.

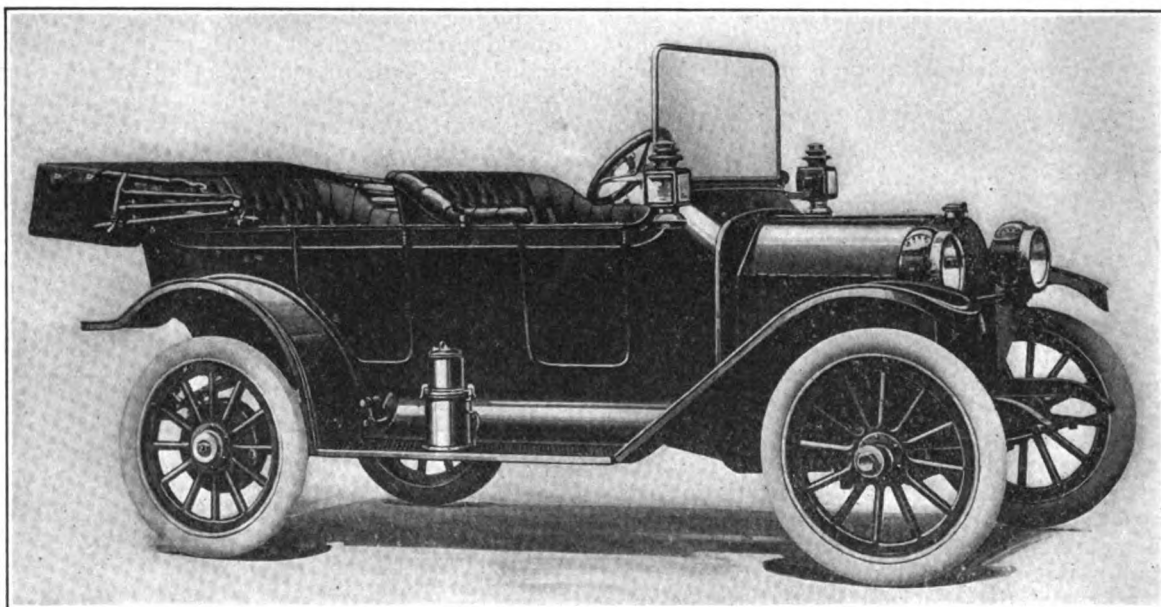
Bearings—High grade ball bearings in the motor transmission, rear axle and wheels.

Body—Metal, five passenger, closed front English torpedo type. Upholstered in genuine black leather.

Color—Raven blue body, hood and wheels. Black chassis, black enamel lamps, nickel finish.

Silencing Valve Noise.

A motor car driver when he has got used to his car and is thoroughly experienced in the driving of it can usually learn quite as much of the behavior of the engine and other parts of the car by his ears as by his eyes. In other words, each sound emitted by the car has its own distinct message to the ear of the driver, who knows whence it proceeds, whether it is normal to the action of the car, or whether it indicates that something is going wrong. In fact so used can one get in this respect that while the car is running properly no notice will be taken of the noise. It may



Five Passenger Detroit which sells for \$850.

inch stroke, developing 25 horse power. Water cooled. Valves enclosed, interchangeable; all on right hand side of motor, adjustable.

Ignition—Thermo-syphon system, tubular type radiator of large water capacity.

Fuel supply—Gravity feed, tank under front seat.

Lubrication—Splash feed, constant level type with pump.

Clutch—Multiple disc running in oil.

Transmission—Selective type, sliding gears; three speeds forward, and reverse.

Drive—Left hand drive, levers and steering gear finished in enamel and nickel.

Control—Gear shifting lever in center of car. Clutch and service brake operated by foot pedal.

Steering gear—Irreversible, worm and sector type.

Front axle—"I" beam; drop forging.

Brakes—Double internal expanding; one 14 inch drum and one 10 inch drum on each rear wheel encased.

Frame—Pressed steel channel section, drop type, permitting low-hung car.

Clearance— $10\frac{1}{2}$ inches.

Springs—Semi-elliptic in front, 36 inches long; platform in rear, each spring 37 inches long.

just as well not exist, but directly a tap or click of an unusual nature occurs the driver's ear will be instantly arrested by it. If he is a good driver he will investigate the matter at the very earliest opportunity.

In one case on hearing a rather peculiar knock in the engine the driver examined it and after a while found out that the cause was located in the valve tappets. The valve spring was then examined and it was found that this had a rather high tension which made it too strong, and in this way the valve was made to close with a very sharp movement. Some springs of lighter tension were then tried, but these, although they acted better than the stronger ones, did not cause the knock to cease entirely. The tappets were then taken out and fibre caps were fitted to them and this addition was found to cause them to act much more quietly when they were adjusted as closely as possible. A further improvement was effected by using light springs under the tappets so that these tappets rose with the valve and in this way the valve noise was quite silenced. It will often be found that the mysterious knocking or clicking of the engine is due to this cause and can easily be remedied by a careful mechanic along the lines indicated above.

The New McIntyre.

The new model of the McIntyre pleasure car has the appearance of not only being strictly up-to-date, but it embodies all the new features thus far devised to make an automobile comfortable, reliable and desirable. The firm has had 42 years experience in building horse-drawn and horseless vehicles, and no amount of capital can fill this in the matter of producing the highest merit, although of course the five factories of the firm and the services of a large engineering staff, ensures all around superiority.

The beautiful straight line body of the McIntyre car is the evolution of generations of mechanics skilled in carriage body building. Eighteen coats of good old-fashioned white lead and linseed oil are put on in steam heated rooms. The lamps are black enameled and nickel plated, as are all other visible metal parts of the car.

The long 115 inch wheel base gives the foundation for comfort that experience has proved to be most satisfactory for a car of this weight.

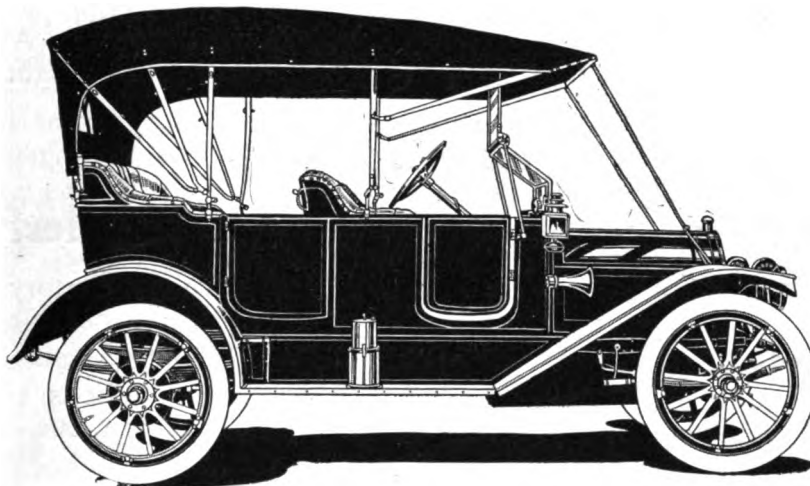
The car is fitted with full set of lamps, two gas con-

motor, finest curled hair stuffing, 115-inch wheel base, multiple disc clutch, inclosed valves, straight line body, three-quarter elliptic 45-inch rear springs.

For full details, address W. H. McIntyre Co., Auburn, Ind.

Curing a Knock.

When a motor car engine develops a knock it is time the matter is seen into as a knock can very easily develop into a smash. On one occasion the driver of a motor car heard such a knock and wisely decided to take down the engine as speedily as possible. When this was done he found that the little end bearing was slack and the gudgeon pin was worn. He, therefore, took out the gudgeon pin and then discovered that the bearing had been worn to an oval shape. This made it necessary in order to secure proper running again to make not only a new bearing but also a new gudgeon pin at the same time. Both the bearing and the gudgeon pin were turned up on a lathe



McIntyre Five Passenger Touring Car. 35 H. P. \$1500.

ected with generator and two oil in front and one oil tail lamp in rear. Wind shield, electric horn and speedometer are included, and where desired gas tank is furnished in place of generator. All McIntyre four-cylinder cars are equipped with self starter, full kit of tools and tool box on step. The starter charges each cylinder with the exact amount of a correctly carbureted mixture of air and gasoline to place precisely the right explosive charge in each in spite of the varying amount of compression. This is done by the patented McIntyre device, so arranged as to charge each cylinder independently of the rest. The starter weighs 11½ pounds, and is substantially made. At the same time the design is so simple that it saves several hundred pounds in weight.

The four-cylinder vertical engine used has its cylinders cast singly. It is of the long-stroke 4 x 5 T-Head type, with three main bearings and bearings on connecting rods of cast nickel babbitt.

The ignition is of the dual type, so that you can start the car either on the magneto or the battery.

Summed up the car has the following up-to-date features:

Self starter, center control, demountable rims, inside door latches, color painting, optional, honeycomb type radiator, all steel chassis construction, quiet, smooth running motor, nickel or black enamel trimming, 18-inch rosewood steering wheel, upholstering excellent quality, oil cups on all spring bearings, long stroke T-head

in the usual way, and when these were fitted the knocking was found to have entirely ceased. In order to allow the bearing to work in properly the engine was kept well oiled for some little time after the repair had been effected as otherwise it would have been extremely probable that the new bearing surfaces would have bound on to one another and heating would have set up causing seizing and a nasty breakdown. This, of course, is quite a usual incident, but it shows that a little care and forethought properly applied will very often save a great deal of work and worry. For this reason the driver even of the smallest car should be a capable mechanic.

"Like a Tale That Was Told."

Unable to understand whence came the sweet strains of "Nearer, My God, to Thee," a dozen woodchoppers in the Santa Cruz, Cal., mountains recently discovered W. F. Westcott of Los Angeles in a car on the bank of a precipice overlooking the San Lorenzo River. Westcott had met with an accident and attached to his automobile was a calliope. Although the wheels of Westcott's machine were wrecked in a collision with a tree his engine was uninjured and he was able to play "Nearer, My God, to Thee" on the calliope while he overlooked the precipice.

To win the fiercest war ever known to motordom, the MICHIGAN "40" enters the field with every big selling feature—electric lights, four forward speeds, extra size tires, complete equipment—at a price no other maker will meet—

\$1,585

The Fight of the Forties

There are 72 makers in a fight for supremacy, with cars around 40 horsepower.

Most of the ablest engineers now give their whole thought to "40's." And some of the finest and most luxurious cars ever built are now in this class.

Yet the prices on Forties, since this war began, have practically been cut in two.

Into this fight comes the Michigan after four years' preparation.

And the offer we make outbids every rival, and every man who knows will concede it.

300 New Features

We have built 5,000 cars and have carefully watched their performance.

We have worked out in the past four years more than 300 improvements.

We have brought to bear on this car some of the best brains in the industry.

Every engineering advancement has been noted and adopted. All the comforts and luxuries have been sought out and included.

Now, in this day of luxurious Forties, we believe that the Michigan outrivals them all.

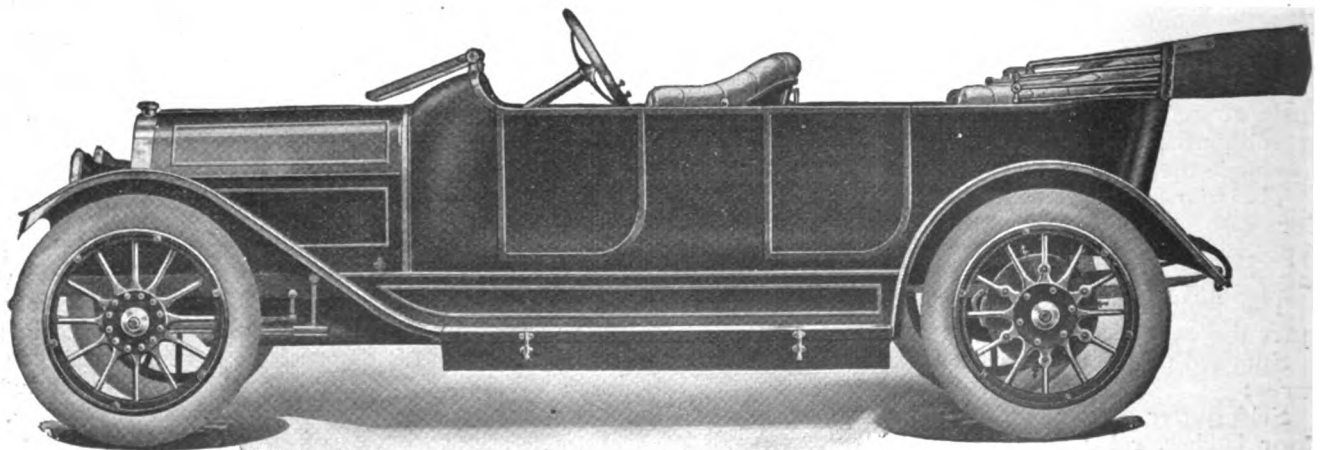
A Wonderful Price

The Michigan factory now has enormous capacity. Every detail of the car is built by modern machinery.

Through wondrous efficiency the cost of this car has been cut 30 per cent in four years

Part of this saving has gone into extras. Part has been taken from the price. Now we offer this car with complete equipment at \$1,585. And no other maker will meet it.

With this car at this price, the Michigan is bound to take first place among Forties. You can prove that in an hour's comparison.



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Michigan "40"

Cameron's Greatest Car

To W. H. Cameron, our designer-in-chief, is due the main credit for the Michigan "40." Cameron has built 100,000 successful cars, and all he has learned makes possible this wonderful machine.

To John A. Campbell this car owes its matchless body, its graceful lines, its finish, its upholstery. Campbell has designed equipages for kings, but this is his greatest achievement.

To an army of experts, selected by Cameron, we owe the strength, the simplicity, the over-capacity of every important part.

These men have combined to produce a wonderful car. And you'll find no car that excels it.

Remember these men when some maker tells you that his higher price buys something better. This is Cameron's best, and Campbell's best. No designers have ever excelled them.

Get All You Can

It is up to you this year, if you are buying a "40," to get all that you can, and pay the least that you need to.

Make careful comparisons. Watch the points that count.

Require big tires—as wide as the Michigan's—for that is the secret of small upkeep. Get four forward speeds, for the world's best cars now have them.

Get electric lights with dynamo. To add them afterward would cost \$125.

Get a roomy car. Compare width of seats, size of tonneau, length of wheel base. Get a comfortable car. Note that Michigan cushions are 14 inches deep. Michigan springs are wide and long.

Compare the brakes, the axles, and every vital part. Here you should have big margins of safety—ample for 60 horsepower.

Compare all these things which mean care and cost, and you'll find no car in the Michigan class that comes anywhere near the Michigan price.

Send for our catalog, giving all the details, and showing the various bodies. Then we'll tell you where to see the car.

MICHIGAN MOTOR CAR COMPANY, Kalamazoo, Mich.

Owned by the owners of the Michigan Buggy Company

Some of the Michigan Features

Four-forward-speed transmission
Oversize tires—35x4 1/2 inches
Electric lights and dynamo
Center control—left-side drive
Motor, 4 1/4 x 5 1/4
Extra effective brakes—16x2 1/4 inches
Big, comfortable springs
Adjustable steering post
Adjustable pedals
Firestone demountable rims—extra rim
14-inch cushions
Rear cushion 50 inches long
Hand-buffed leather upholstery
Best curled-hair filling

Wheel base 118 inches
Nickel mountings
Large over-capacity, giving big factors of safety
Pressed steel, full floating rear axle
Axles sufficient for an 80-horsepower car
Genuine cellular-type radiator
Best mohair top, side curtains and envelope
Windshield built in as part of body
Electric horn
\$50 speedometer, 4-inch dial
Special foot rail
Swing robe rail

Rear tire irons
Complete tool equipment
Tool chests under running boards

There is such a difference of opinion about the various types of self-starters that we have not adopted any one type as regular equipment. We prefer to leave this selection to the buyer. We equip with either the gas or a positively efficient electric starter at a moderate extra price.

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Please mention the Automobile Dealer and Repairer when writing to advertisers.

STEAM CAR DEPARTMENT

This department is intended for owners, users and others interested in the steam car.

Those who have trouble with their steam cars are asked to give clear and full particulars, and their queries will be answered as correctly as possible by an expert. It will be considered a favor if our readers will contribute to this department, giving such information as may be useful to others using the steam car.

STEAM CARS.

Information of a General Character in Relation to Fittings and Attention.

In purchasing any car when the chassis only is first bought and the body fitted to suit the buyer's own ideas, care should be taken that the car is not overloaded, and this particularly applies in the case of a steamer. The great hill-climbing powers of a steam car, and its speed and power generally when compared with a gasoline car of the same rated power, are well known, but this does not imply that the steam car will carry a great weight. A 10 h.p. steam car may be quite as fast on the level and a better hill climber than a 40 h.p. gasoline car, but to fit bodies of equal weight to both cars would be courting trouble in the case of the steam car.

Two instances have been recently met with that furnish good illustrations of this. In one case, a 10 h.p. steam car was fitted with a five-seated side-entrance torpedo body with high side doors to both seats, an extra heavy type of hood and screen, very heavy detachable wheels with a spare wheel, head lights, generator, and luggage rail behind. With five people and luggage this car was used in one of the hilliest parts of the country, and took its load up hills on which it would be no disgrace for a 30 h.p. gasoline car, equally loaded, to drop to its bottom gear. In order to do this work, this car was drawn upon up to its very limit, and could only have a short life.

The second case was a 15 h.p. steam car fitted with a heavy limousine body seating four inside, with a luggage grid on roof and one also behind, and a very full equipment. The fact that this car has done two years' running under these conditions with practically no trouble is a good recommendation, but the fact remains that the car was not built for such a load, and, although it had the power to propel it, the upkeep must in time be heavy, as the chassis was not built for such work.

Graphite Exposed to Heat or Moisture.

All screw connections exposed to considerable heat or to moisture are liable to become very difficult to undo if proper precautions are not taken. The unions on the generator of a steam car or the unions on the exhaust pipe of a gasoline car are good illustrations of this. The brake pins and nuts, the nuts on spring clips, etc., are also very likely to become rusted on. Whenever any such connection is removed, a little pure graphite mixed with oil to a paste of the consistency of cream should be applied to the threads. The nut or union can then be unscrewed next time without difficulty, as, although the oil may be burned off, the graphite never leaves the metal, so the threads cannot seize nor oxidize and give trouble.

Why makers do not adopt this system with new cars is not easily understood, as it costs practically nothing. Those who have struggled with nuts firmly rusted on somewhere underneath the car (such as an axle spring clip) will appreciate this point.

Attention to Burners.

The burner, as has been previously pointed out, may be termed the carburetor of the steam car. The mixture of air and gas in the induction tube of the burner is exactly the same as that in the induction pipe of a gasoline engine, but in the former case it is under considerable pressure, while in the latter it is generally somewhat below atmospheric pressure. One half of the bad pulling of gasoline engines can be traced to the carburetor, and in the same way the general cause of bad running on a steam car is due to something amiss with the burner. The steam car owner has not in burners the same choice as a gasoline car owner has in carburetors.

A steam car will generally run perfectly with the burner fitted by the makers, if it be in good order. A dirty vaporizer is the most common trouble, and the difference in the running that a clean vaporizer will make has to be experienced to be credited. A dirty vaporizer will give an otherwise perfect car all the appearance of needing a thorough overhaul. The operation of cleaning a vaporizer takes a few minutes only, and even if it has only been recently cleaned, it should again be looked to if the running of the car suddenly gets weak.

A vaporizer will often run a car some thousand miles or so without cleaning, but dirt in the fuel, etc., may foul it in a few miles. The size of the nipple of the burner is of the utmost importance. The jets on the nipple are a different size for each model of car, but it is important to see that the right nipple is in use, as these are generally interchangeable as to their other dimensions on all models.

In the Stanley steam cars there are two jets, each supplying one-half of the burner. These jets must be of the same size, yet cases have been found where the jets have been interfered with, causing the two sides of the burner to give very different results and thus spoiling the running. The state of the pilot light is also of importance, as if this be allowed to get into bad condition it affects the main burner in the same way.

Foolproof Control.

The aim of designers of modern steam cars has been to render it impossible for the driver to do any damage to the car either by carelessness or otherwise. On the Stanley cars not only is there a fusible plug fitted to the boiler, the melting of which, when the water gets too low, puts the fire out and relieves the pressure, so preventing all danger of damage to the boiler, but a thermostat is also fitted, which acts directly on the burner. When the water gets too low, and before it reaches the level at which the fusible plug would melt, the thermostat comes into operation and cuts the fire right out. Should the thermostat fail for any reason, the fusible plug will come into action, so the boiler is doubly guarded against carelessness on the driver's part, as the water can only get low through carelessness. When the thermostat is in operation the fire cannot come on again until the water level has been raised above the level at which the thermostat acts.

On the White car there is a device termed the flow motor. All the water on its way to the generator must pass through this until the boiler gets hot enough. On its way through the flow motor the water turns on the fire, so there can be no fire on when no water is entering the boiler. The pumps are coupled to the engine, so when the engine stops the water supply stops and the main fire goes out.

Automobile repair bills— their most common cause

Recently we made a canvass of automobile repair shops in New York.

We asked the question: "What share of the engine troubles that come to you are caused by poor lubrication?"

The answers ranged from "one-third" to "70%."

Probably every owner of these damaged cars *thought* he was using a good lubricating oil.

As a matter of fact, oils that yield efficient lubrication are rare. And their wearing quality is often overlooked.

A worn-out oil thins down and ceases to lubricate.

Then comes trouble—pitted and burned-out bearings, "frozen" pistons, scratched cylinders, and even broken parts.

You cannot watch the lubricating process in your wrist pins, bearings and cylinders. But you *can* be sure of this—

An oil that is wearing poorly, is lubricating poorly.

Gargoyle Mobiloils were produced after careful study, by the world's authoritative leaders in scientific lubrication, the Vacuum Oil Company.

In wearing quality, few automobile lubricating oils on the market even approach them. We speak from experience. You can demonstrate it for yourself.

Though not low priced, in economy and lubricating efficiency we can safely say that Gargoyle Mobiloils stand alone.

The chart on the right shows the correct grade for 111 cars. Our complete chart, covering 400 cars, mailed on request.

By carrying Gargoyle Mobiloils, with our chart of recommendations, you can say to the driver of any car: "I can give you the correct grade of oil for your car. It is recommended by the Vacuum Oil Company—the recognized leaders in lubrication."

By handling Gargoyle Mobiloils you

also get the benefit of the strongest advertising campaign ever run for automobile lubricants. Following our large space advertisements in the Saturday Evening Post, Collier's, Literary Digest, Life, and Scientific American, we are now running full pages in leading monthly magazines. Also in ten leading automobile magazines.

VACUUM OIL CO., Rochester, U. S. A.

DETROIT Ford Building BOSTON 49 Federal St. NEW YORK 29 Broadway CHICAGO Fisher Building PHILADELPHIA 4th & Chestnut St. INDIANAPOLIS Indiana Pythian Bldg.

Distributing warehouses in the principal cities of the world



A guide to correct Automobile lubrication.

Explanation: In the schedule the letter opposite the car indicates the grade of Gargoyle Mobiloil that should be used. For example, "A" means "Gargoyle Mobiloil A." "Arc." means "Gargoyle Mobiloil Arctic." For all electric vehicles use Gargoyle Mobiloil A. The recommendations cover both pleasure and commercial vehicles unless otherwise noted.

MODEL OF CARS	1908	1909	1910	1911	1912
Abbott Detroit	A	Arc.	Arc.	Arc.	Arc.
Alco	A	Arc.	Arc.	Arc.	Arc.
American	A	Arc.	Arc.	Arc.	Arc.
Apperson	A	Arc.	Arc.	Arc.	Arc.
Atter	A	Arc.	Arc.	Arc.	Arc.
Com'l	A	Arc.	Arc.	Arc.	Arc.
Austin	A	Arc.	Arc.	Arc.	Arc.
Autocar (2 cyl.)	A	Arc.	Arc.	Arc.	Arc.
" (4 cyl.)	A	Arc.	Arc.	Arc.	Arc.
Bentley	A	Arc.	Arc.	Arc.	Arc.
Bergdoll	A	Arc.	Arc.	Arc.	Arc.
Brush	A	Arc.	Arc.	Arc.	Arc.
Buick (2 cyl.)	A	Arc.	Arc.	Arc.	Arc.
" (4 cyl.)	A	Arc.	Arc.	Arc.	Arc.
Cadillac (1 cyl.)	A	Arc.	Arc.	Arc.	Arc.
" (4 cyl.)	A	Arc.	Arc.	Arc.	Arc.
Cartier	A	Arc.	Arc.	Arc.	Arc.
Com'l	A	Arc.	Arc.	Arc.	Arc.
Cass	A	Arc.	Arc.	Arc.	Arc.
Chadwick	A	Arc.	Arc.	Arc.	Arc.
Chalmers	A	Arc.	Arc.	Arc.	Arc.
Chass.	A	Arc.	Arc.	Arc.	Arc.
Cole	A	Arc.	Arc.	Arc.	Arc.
Columbia	A	Arc.	Arc.	Arc.	Arc.
Columbia Knight	A	Arc.	Arc.	Arc.	Arc.
Couple Gear	A	Arc.	Arc.	Arc.	Arc.
Croston-Keston	A	Arc.	Arc.	Arc.	Arc.
Daimler	A	Arc.	Arc.	Arc.	Arc.
Daimler Knight	A	Arc.	Arc.	Arc.	Arc.
Darracq	A	Arc.	Arc.	Arc.	Arc.
De Dion	A	Arc.	Arc.	Arc.	Arc.
Delahaye	A	Arc.	Arc.	Arc.	Arc.
Delaney-Belleville	A	Arc.	Arc.	Arc.	Arc.
Elmore	A	Arc.	Arc.	Arc.	Arc.
E. M. R.	A	Arc.	Arc.	Arc.	Arc.
Fiat	A	Arc.	Arc.	Arc.	Arc.
Flanders	A	Arc.	Arc.	Arc.	Arc.
Ford	A	Arc.	Arc.	Arc.	Arc.
Franklin	A	Arc.	Arc.	Arc.	Arc.
Com'l	A	Arc.	Arc.	Arc.	Arc.
Gramm	A	Arc.	Arc.	Arc.	Arc.
Gramm-Lucas	A	Arc.	Arc.	Arc.	Arc.
Hewitt (2 cyl.)	A	Arc.	Arc.	Arc.	Arc.
Hewitt (4 cyl.)	A	Arc.	Arc.	Arc.	Arc.
Hudson	A	Arc.	Arc.	Arc.	Arc.
Hepmole	A	Arc.	Arc.	Arc.	Arc.
International	A	Arc.	Arc.	Arc.	Arc.
Interstate	A	Arc.	Arc.	Arc.	Arc.
Isotta	A	Arc.	Arc.	Arc.	Arc.
Itala	A	Arc.	Arc.	Arc.	Arc.
Jackson (2 cyl.)	A	Arc.	Arc.	Arc.	Arc.
" (4 cyl.)	A	Arc.	Arc.	Arc.	Arc.
Kelly	A	Arc.	Arc.	Arc.	Arc.
Kissel-Kar	A	Arc.	Arc.	Arc.	Arc.
Com'l	A	Arc.	Arc.	Arc.	Arc.
Kline Kar	A	Arc.	Arc.	Arc.	Arc.
Knox	A	Arc.	Arc.	Arc.	Arc.
Krit	A	Arc.	Arc.	Arc.	Arc.
Lambert	A	Arc.	Arc.	Arc.	Arc.
Com'l	A	Arc.	Arc.	Arc.	Arc.
Lancia	A	Arc.	Arc.	Arc.	Arc.
Locomobile	A	Arc.	Arc.	Arc.	Arc.
Lozier	A	Arc.	Arc.	Arc.	Arc.
Mack	A	Arc.	Arc.	Arc.	Arc.
Marion	A	Arc.	Arc.	Arc.	Arc.
Marmon	A	Arc.	Arc.	Arc.	Arc.
Matheson	A	Arc.	Arc.	Arc.	Arc.
Maxwell (2 cyl.)	A	Arc.	Arc.	Arc.	Arc.
" (4 cyl.)	A	Arc.	Arc.	Arc.	Arc.
Mercedes	A	Arc.	Arc.	Arc.	Arc.
Mercedes Knight	A	Arc.	Arc.	Arc.	Arc.
Mercer	A	Arc.	Arc.	Arc.	Arc.
Minerva Knight	A	Arc.	Arc.	Arc.	Arc.
Mitchell	A	Arc.	Arc.	Arc.	Arc.
Moon	A	Arc.	Arc.	Arc.	Arc.
National	A	Arc.	Arc.	Arc.	Arc.
Oakland	A	Arc.	Arc.	Arc.	Arc.
Oldsmobile	A	Arc.	Arc.	Arc.	Arc.
Overland	A	Arc.	Arc.	Arc.	Arc.
Packard	A	Arc.	Arc.	Arc.	Arc.
Panhard	A	Arc.	Arc.	Arc.	Arc.
Panhard Knight	A	Arc.	Arc.	Arc.	Arc.
Peerless	A	Arc.	Arc.	Arc.	Arc.
Pennsylvania	A	Arc.	Arc.	Arc.	Arc.
Pierce Arrow	A	Arc.	Arc.	Arc.	Arc.
Com'l	A	Arc.	Arc.	Arc.	Arc.
Pope Hartford	A	Arc.	Arc.	Arc.	Arc.
Premier	A	Arc.	Arc.	Arc.	Arc.
Rambler	A	Arc.	Arc.	Arc.	Arc.
Rapid	A	Arc.	Arc.	Arc.	Arc.
Regal	A	Arc.	Arc.	Arc.	Arc.
Renault	A	Arc.	Arc.	Arc.	Arc.
Roy	A	Arc.	Arc.	Arc.	Arc.
Royal Tourist	A	Arc.	Arc.	Arc.	Arc.
Selden	A	Arc.	Arc.	Arc.	Arc.
Simplex	A	Arc.	Arc.	Arc.	Arc.
Speedwell	A	Arc.	Arc.	Arc.	Arc.
Stanley	A	Arc.	Arc.	Arc.	Arc.
Stearns	A	Arc.	Arc.	Arc.	Arc.
Stearns Knight	A	Arc.	Arc.	Arc.	Arc.
Stevens-Duryea	A	Arc.	Arc.	Arc.	Arc.
Stoddard Dayton	A	Arc.	Arc.	Arc.	Arc.
Stoddard Dayton Knight	A	Arc.	Arc.	Arc.	Arc.
Thomas	A	Arc.	Arc.	Arc.	Arc.
Walter	A	Arc.	Arc.	Arc.	Arc.
Welch	A	Arc.	Arc.	Arc.	Arc.
Welch Detroit	A	Arc.	Arc.	Arc.	Arc.
White (Gas)	A	Arc.	Arc.	Arc.	Arc.
" (Steam)	A	Arc.	Arc.	Arc.	Arc.
Winton	A	Arc.	Arc.	Arc.	Arc.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

A Good Valve Grinder and Grinding Compound.

We illustrate with this article the Owen Valve Grinder a convenient tool for grinding automobile engine valves, which should be a part of the outfit of every private or public garage. This tool weighs only three and one-quarter pounds; requires no pressure; does not cramp or tire the hands, and by its aid the grinding may be done quickly and effectually. The tool is thoroughly warranted and is made of the finest steel throughout. It will be sent to any of our readers on receipt of the retail price of two dollars, including a supplementary spring for lifting the valve.

The same manufacturers are also marketing a valve seating compound, known as "Gryndyn," which is described as the fastest cutting compound made, and if



The Owen Valve Grinder. Made by Stewart & Co., 3 Cortlandt St., New York City.

used as directed the manufacturers state it will produce the finest results. It will leave no mark or ring on the valve or seat if properly used. It is neatly packed in strong screw-top tin boxes and retails at 35 cents per box. Any of our readers who may be interested in either of the above articles should write to Stewart & Company, 5 Cortlandt Street, New York City, and in doing so be sure to mention the name of this magazine.

Speedo.—The Fulton-McCutchan Company, 1153 Michigan Avenue, Chicago, Ill., manufacturers of Speedo, say that you will never know how perfect your engine can run until you try Speedo. They further say that it is as essential as the carburetor. It can be attached in five minutes on intake manifold. It breaks up and remixes each particle of gas with sprays of new air cutting crosswise through the mixture. In other words it automatically gives just the proper addition of air your running speeds require. They say in their advertisement in this issue that your money will be refunded if you are not satisfied. They want dealers to send for samples and special proposition.

Are You Getting Your Share of the Dollars?—A good vulcanizing outfit for repairing tires is a money-maker in any shop, especially if you purchase the right machine and charge correct prices for the work. An attractive announcement appears in this issue from the Williams Foundry & Machine Company, Glendale Avenue, Akron, Ohio, in which they state that they are in a position to assist repair men in making money. They call special attention to their tire repairing outfits which cost from \$40 to \$1000, depending upon how much and what range of work is to be handled. This concern has made an exhaustive study of the tire repair business and they manufacture every conceivable device for this purpose. Furthermore, the quality of their product is of the highest. Any reader who is likely to be interested in tire repair outfits or equipment should not fail, for the sake of the valuable information to be obtained, to write immediately to this company for their catalog 121, and in all correspondence mention The Automobile Dealer and Repairer.

A Self-Vulcanizing Inner-Liner.—We understand that the latest product of the Hagstrom Bros. Mfg. Company of Lindsborg, Kansas is a Self-Vulcanizing Inner-Liner which the manufacturers state is a godsend to motorists living in rural communities and likewise to the tourist as it can be inserted on the road. This Self-Vulcanizing Inner-Liner is prepared with a coating of pure raw rubber cement of the highest quality and it is only necessary to wash off the soapstone with gasoline, and wash out the casings likewise, inserting the liner, after allowing a short time to dry. The ordinary heat produced by the tires while in motion causes this to vulcanize, and it is said, really making it a part of the casing. Write for further particulars and prices to the company above.

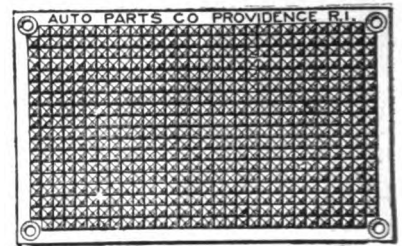
A Remarkable Varnish.—Every manufacturer, every dealer, every owner knows that the finish of a motor car when in perfect condition, is one of its most attractive features, that when finished with a first class automobile body varnish, the body of the car goes through the season in good shape. He also knows that until now the finish on the chassis has only lasted in perfect condition a few weeks or at most a few months. The fact is that there has been no finish for the chassis, which would stand up under the hard conditions it must meet, and the severe treatment it must receive. Mud, road oil and grease on the running gear, rain and engine oil on the heated hood, excessive vibration, extreme exposure, and ill usage of all kinds on the fenders, above all the soapy water wash down to which the whole chassis is regularly subjected inevitably kill the lustre of any varnish until now used for this purpose. There is nothing new in this statement. It is a universal experience. Valentine & Company, whose researches with new materials and new methods has been one of the features of the American varnish industry from the beginning, have put on the market a new varnish, Vanadium Chassis Finishing, which they claim to be resistant to the action of soapy, muddy water, road oil, grease, lime, etc. They are sending out small samples of this varnish to any one in the trade who writes for them.

Removal.—The Atlas Chain Company, whose offices were formerly located in the Bush Terminal No. 4, Brooklyn, N. Y., have removed to 376 Birnie Ave.,

Springfield, Mass., where all correspondence should be addressed.

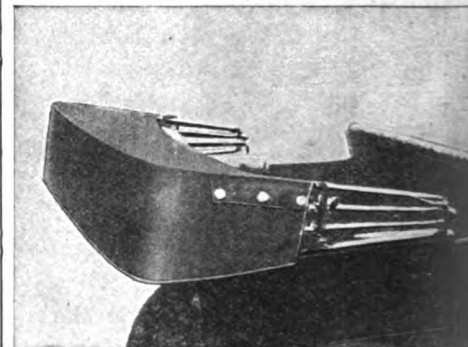
Necessary and Ornamental.

Illustrated herewith will be found two devices made by the Auto Parts Co., Providence, R. I., which are not expensive but yet will be found most useful and desirable. The first is a heel plate that will not show any signs of wear



A Handsome Heel Plate.

after a year's use, and which is always pleasing to the eye. The next is a slip cover for Ford cars. The covers are made from the finest silk mohair, put together in best possible manner, and are guaranteed to be a perfect fit. Do not construe this cover with those ad-



To Preserve the Top.

vertised for \$5, as it is not made from oilcloth, but genuine rubberized silk mohair, custom made, and is a decided improvement to the car. Remember, that your top when up adds about 20 per cent. to the cost of propelling your car, and when down will be quickly ruined without this cover. For full information address as above.

Michener's Gasoline Saver and Primer.

—Our readers, many of them, will be interested in the announcement in this issue of E. S. Michener, 800 Washington Street, New Castle, Pa., in which he describes his gasoline saver and primer. His advertisement shows the importance of his device which is controlled from the seat and enables the driver to regulate the carburetor for all speeds. Mr. Michener states when his gasoline saver is in use and the valve is left open, it forms an effective lock for the car against theft, as with the valve open the engine cannot be started. But consult his announcement and write to him, taking particular notice of his guarantee to save gasoline and increase speed on the same amount of gasoline. He says if you are not satisfied after 30 days' trial, you can return the device, if kept in good condition, and get your money back.

The name of the Clarke-Carter Automobile Company, of Jackson, Michigan, has been changed to the Cutting Motor Car Company.



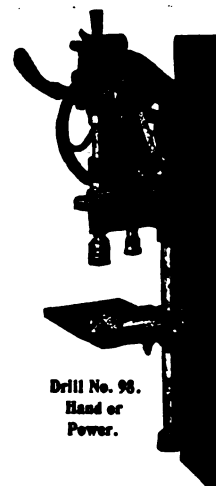
Forge No. 651 E
23x30 inches. Electric
or Hand Blower.



Down Draft Forge
No. 660. Hearth 28x40 in.
Hand or Electric Blower.



Drill No. 99.
Hand or
Power.



Drill No. 98.
Hand or
Power.

The Forge for your garage—a clean shop and a quick weld.

“Buffalo”

The Drill Press for your garage—Ball Bearings; Automatic and Lever Feed “Suregrip” Chuck.

Among the 40 different forges of our make, we recommend No. 660, shown above, for garages, because it is equipped with our patented “Down Draft Hood,” through which smoke and gases are mechanically removed, keeping the shop clean and healthful. It is also fitted with a cinder catcher and with hand or electric blower. It will take the heaviest welds, in the shortest time, with the least effort.

Two styles, very suitable for garages, are shown above. They embody the very latest improved features. Are quiet running, of moderate capacity and very reasonable in price.

Prices and specifications on request. Address Dept. B. T.

Buffalo Forge Co. Buffalo, N.Y.

“Standard” Davis Robe.—These lap robes are hand made, of special weave, heavy triple fabric, wind and water proof mackintosh cloth. This cloth consists of two layers of linen whip-cord, with an interlining of pure rubber gum, which makes a handsome and serviceable robe. It is lined with heavy imported dark green plush. It has fancy braid and patent fasteners at the edges. The wearing portion under the feet is calf-skin leather. A positive guarantee goes with these robes. They are closed at the bottom, making it impossible for the feet to be exposed. The company further states that there is not the slightest crack in this cover through which the heat of the body can escape. The man who uses one of these lap robes, the manufacturers say, will keep comfortable in any degree of cold all day long no matter how much the wind howls about him. But write for booklet containing full particulars of these robes as well as the Davis Arctic Over Pants, especially for the man at the wheel. See full page announcement in this issue which will not be repeated again. So if you are interested write at once to the Davis Robe and Armor Co., 10 No. State St., Chicago, Ill.

Dealers should write promptly to W. H. McIntyre Company, Auburn, Indiana, for catalog, etc., which will give full particulars with respect to their new 1913 car for which they want agents everywhere. We understand they have an attractive proposition.

Perfection Quick Detachable Rim Remover.—In this issue will be found the announcement of the Perfection Mfg. Co. of New Martinsville, W. Va., and a brief description of their Perfection Quick Detachable Rim Remover, which is simple

in construction and acts so effectively that in 30 seconds a rim is released. Dealers sell this remover or ought to. If you cannot get one from your dealer write direct to the manufacturers as above and mention the Automobile Dealer and Repairer.

Continental Junior Motor.—This motor is made by the Continental Engine Company of Dallas City, Ill. Chicago office 1146 Michigan Ave. It has four cylinders. It is said to be silent, powerful and reliable. Write for further particulars and mention the Automobile Dealer and Repairer. See advertisement.

Mott's Patent “Pressure” For Vulcanizing.—The Richardson Tire Company of Hartford, Conn. has a new announcement in this issue describing Mott's Patent “Pressure” for vulcanizing. They say with this “Pressure” you get more solid cure because you have more pressure and absolutely no danger of blow-outs or spoiled work. No air, springs, or mechanical device used. Will last a lifetime and the price is away below that of the best air bags. But consult the advertisement of this company on another page and write for further particulars mentioning the Automobile Dealer and Repairer.

Stevens Auto Cleaner.—This device is said to be indispensable. It saves your hands and clothing, and prolongs the life of costly machinery by instantly removing grease, grit and dirt. It is made by the Stevens Manufacturing Supply Company, 1223 Wabash Ave., Chicago. See advertisement on another page.

Unique Selling Plan.—The Aermore Mfg. Co., 1536 Michigan Avenue, Chicago, Ill., has adopted a unique plan for selling its Aermore Exhaust Horn. They

are sending out to garage owners, dealers in automobile supplies, accessories, etc., one full sized Aermore Exhaust Horn for demonstrating purposes free. This company has discovered that a prospective customer can best be sold by a demonstration. Every dealer who sees this notice should write to this company, as above, for further particulars. This horn is built on the pipe organ principle and gives a gentle, courteous warning—a musical signal—the blending of four major notes of the musical scale.

Blowers, Forges and Blacksmith Tools.—Our readers among repair men and garages who have not already noticed the announcement which has been running for some time of the Canedy-Otto of Chicago Heights, Ill., should turn to it in this issue and write for their 160 page tool catalogue, giving full particulars of their different forges, blowers, drills and other blacksmith's tools such as can be used by those who repair automobiles. In writing mention the Automobile Dealer and Repairer.

For the convenience of middle western customers, J. H. Williams & Company, makers of the “W” in a diamond drop forgings of Brooklyn, N. Y., have opened an office and warehouse at 40 So. Clinton Street, Chicago, Ill., where a stock of their many drop forged specialties will be carried in stock.

The Rogers Speedometer.—We are informed by one of our subscribers that the Rogers Speedometer is for sale by the Atlas Manufacturing Company, 129 Reade Street, New York City. We trust this information will reach the particular subscribers who wanted to know the address.

Classified Advertisements

Under this head will be printed advertisements of **Second Hand Cars Wanted** or for **Sale, Accessories of any kind Wanted** or for **Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines For Sale or to Exchange**, at the uniform price of three cents a word, including the name and address, for each insertion, payable in advance. No advertisement will be inserted for less than 50 cents, however small. Remittances may be made in postage stamps or in any convenient way.

Address **MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.**

Classified Advertisements

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 223 West 57th St., N. Y. City.

PATENTS SECURED—C. L. Parker, Patent attorney, 962 G Street, Washington, D. C. Inventor's handbook upon request.

BROKEN CRANKSHAFTS, cylinders, crankcases, flywheels, gear teeth, pistons, perfectly welded and machined ready to replace. Guaranteed and references. Machinery up to 5 tons welded. Atlas Welding Works, 7476-78 Irving St., Rahway, N. J.

TOPS—Until further notice, runabout top \$22, touring car tops \$35. C. G. Meyer & Son, Tiffin, Ohio.

CYLINDERS REGROUND, and fitted with new pistons and rings for \$15.00 per cylinder. We make parts and cut gears of all kinds. Send us your old parts and we will repair or duplicate them in record time. Cracked cylinders, gear cases, etc., welded and made good as new. Aluminum, bronze and brass castings of every description. Phosphor bronze bushings in the rough carried in stock. Address, The Adapt Machinery Company, 1624 Wabash avenue, Chicago, Ill.

DON'T FORGET.
FORD AGENTS—WE MAKE A SPECIALTY of Dust Hoods to cover Top when clashed down for Model T Ford 1910-1911-1912 Cars. Write for prices, also Cellulosa, best Substitute for Glass used in Automobile and Buggy Storm Fronts, Side Curtains, etc., Sheets 20 x 36 in. 86c, 12 x 30 in. 86c, 18 x 20 in. 45c, 20 x 24 in. 68c, postpaid. Haews Storm Front Co., Coldwater, Mich.

AUTOMOBILE boilers bought, sold and repaired. Lucas & Son, Bridgeport, Conn.

MODEL T FORD OWNERS—You need my valve adjusters. They make a good car better. More power, better mileage, less noise. A good proposition to owner agents. Ira Lavender, Webster City, Iowa.

N. E. AUTO LIST—Weekly registrations of all N. E. States as reported, \$10 yearly, year book \$3. Auto List Co., 138 Pearl St., Boston.

500 NEW pressed steel auto frames 163 in. long, 38 in. wide. Send for sketch. \$10.00 each. Lucas & Son, Bridgeport, Conn.

BROKEN CYLINDERS AND CRANKCASES welded expertly and guaranteed. See our adv., page 18, for details. Waterbury Welding Company, Waterbury, Conn.

FOR SALE—Shumard's Patent full elliptic front spring outfit for Ford cars, 2000 sets sold first year. A great seller. Patent rights, jigs and stock. Cannot take proper care of this owing to other pressing business. Address, E. C. Shumard, 216 Webster St., Cincinnati, Ohio.

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28x3—\$6.00 32x3—\$8.00 28x3 1/2—\$9.25
30x3—7.00 34x3—9.00 28x3 1/2—10.00
Also all other sizes and Tubes proportionately low. Shipped on approval. Also 1000 motor cycle tires sacrificed. Write today for Price List. The Automobile and Cycle Company of America, Dept. Six, 1769 to 1787 Broadway, New York City.

AUTOMOBILES—A. C. C. A. Prices talk! Every make, every model. Hundreds runabouts, racy roadsters, five seven-passenger touring cars, \$50 up. Guaranteed five years. Shipped freight prepaid! Write today for largest illustrated Catalog published! The Automobile and Cycle Company of America, Dept. Five, 1769-1787 Broadway, New York City.

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Garages—Portable-permanent, steel or wood. Knapp System, 123 Liberty St., New York City, N. Y.

CYLINDERS REBORED, pistons and rings fitted, gear cutting of all kinds and materials, transmission and bev. gears of nickel steel hardened and tempered, guaranteed better than factory, crank shafts, connecting rods, crank cases, axles, any part of auto or motor reproduced like original, phosphor bronze bushings carried in stock, send old or broken parts to go by. The shop of quality, McCadden Machine Works, Minneapolis Branch, Minneapolis, Minn.

WELDING—\$\$\$\$\$\$ saved on auto parts. Ship all broken castings to us. Save time and \$\$\$\$\$\$. National Welding & Mfg. Co., Incorporated, Mfrs. of Complete Welding Plants, Welders and Brazers of all Metals, 526 Jackson Blvd., Chicago, Ill.

WHEN your tires or tubes need repairing, send them to us. Our prices are lowest, we are always prompt and reliable. We sell all kinds of tires and accessories at special prices. It will pay you to "Get Acquainted." New York Steam Auto Tire Works, 312 West 52nd St., New York City.

FORD DEALERS AND OWNERS—We can save you money on top dust hoods. C. G. Meyer & Son, Tiffin, O.

WE BOUGHT at bargain from bankrupt factory 500 mohair tops, \$40.00 kind will sell at \$10.00 each cash, complete with curtains, covers and wind shields. This price will move quick so get your order in early. Address Puritan Machine Company, 51 10th St., Detroit, Mich.

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\$35.00—Sterling Wind Shield—\$7.40
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OXY-ACETYLENE WELDING PLANTS
The Admiral Welding Machine is the ideal welding device; large capacity; self generating throughout; portable; complete in every detail; a perfect machine for all work, large or small. Send for our booklet, "Welding," and full description. Price, \$200, f. o. b. Kansas City. Admiral Mfg. Co., 715 Lydia Ave., Kansas City, Mo.



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PROVED BY TEST

Radiators made or repaired for any type car.

Have a new radiator made for your car and increase its value 25 per cent.

Our corps of expert repairmen at your service. All charges based on time consumed. Results guaranteed.

Send in your old radiator and get estimate.

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Good condition. Price \$150.00. 15 Horse
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GUARANTEED, RE-CONSTRUCTED
Lozier cars—1909, 1910-1911. Also other
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Ave., Chicago.

Another Offer by Dunk
\$15.00 New Auto Trunk—\$6.50
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WE SHIP SUDDEN, \$40.00 Tops Mohair
with curtains, \$10.00; \$35.00 Windshield
\$7.50; 32 x 3 Tires, \$6.00; 32 x 3 1/2 Diamond
Goodyear, etc., first quality, \$14.00; Speedo-
meters, \$1.75; Tool Boxes, \$18.00; Ford Radi-
ator, \$18.00; Buick Radiator, \$30.00; Puritan
1 in. carburetor, \$1.00; Electric Horn,
\$5.00; Remy Magneto Coils, \$18.50. At your
service for further information. Puritan
Machine Co., 53 10th St., Detroit, Mich.

"A New One."
A \$2500 Auto for \$150.00
Build your own car. We will sell you
complete set of Axles, Frame, Springs,
Wheels, Steering Gear and Radiator \$150.00.
With plan for putting together.
AUTOPARTS MFG. CO.
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justers are the simplest, surest and light-
est silencers in the world. \$1.50, postpaid.
Townsan Auto Spec. Co., Mitchell, S. D.

CHAUFFEURS COMPLETE OUTFIT SAC-
RIFICED.—Consisting elegant mink fur
lined coat, Persian lamb collar \$35, pair
of elegant bear robes \$15 each, Racoon Cap
\$5, pair of fur gloves \$4, pair of goggles
50c., 1 pair leather leggings \$3.50. Will sell
separately or the lot, all new, never worn,
original price \$225. G. Chase, 118 East
28th St., New York.

Dunk Says It's Best.
"Do It."
Detroit Self-Starter. Throw your Crank
away. Sold direct. No agents. \$10.00
Every Sale Makes a Friend.
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Detroit, Mich.
No Branches. Beware.

FOR SALE—Hartford Tire Pump, power or
foot drive \$5.00. Two sheet iron running
board battery or tool boxes 9 x 10 x 16, each
\$3.00. Address G. H. Waltman, Bethlehem,
Penna.

WANTED—Man to take charge of enamel-
ing department of large automobile plant.
One who thoroughly understands dipping
and baking of fenders, hoods, etc.—Ad-
dress M., P. O. Box 654, N. Y. City.

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Ford Model T Radiators.....\$18.00
Ford Model R-N- or Sm. Radiators.. 23.00
Hup Radiator..... 25.00
Buick 10 Radiator..... 26.50
Buick 16 and 17 Radiators..... 32.50
Buick 19 Radiators..... 27.50
We make them for other cars too.
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Detroit, Mich.
No Branches. Beware.

A GOOD RELIABLE ALL AROUND MAN
desires to secure a position as repair man
with a reputable garage or concern which
is repairing and dealing in automobiles.
Have had considerable experience on auto-
mobile work and am holding now a position
as Machine Shop Foreman in a manufac-
turing establishment. Have the ability to
make good. Also will consider entering
into partnership with anyone looking for a
partner. Have a modern apparatus on
hand which can be installed in connection
with repair shop to good advantage. Any
further information will be furnished upon
request. Location mostly desired in the
South or Middle West. Address E. H. Z.
care of Automobile Dealer and Repairer,
Post Office Box 654, New York.

The Dunk Way Pays.
Make your car up-to-date.
Our new fore door five passenger bodies
completely finished, \$52.50. New Mohair
tops at \$13.50.
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Detroit, Mich.
No Branches. Beware.

"WE SHIP SUDDEN."
Prices lower and goods of best quality.
WE want your business on these bases.
Plate glass windshield\$ 7.50
Mohair tops (give size) 10.00
4 Door Bodies complete..... 55.00
Side lamps, Castile make 2.00
Head lights, \$10.00 kind..... 3.10
Auto trunks, \$12.00 kind..... 5.10
32 x 3 1/2 Goodyear tires (1t)..... 14.00
32 x 3 Morgan & Wright..... 5.00
Spark plugs, \$1.00 kind..... .35
All kinds of goods at prices you can af-
ford. State your needs.
PURITAN MACHINE CO.,
53 10th St.,
Detroit, Mich.

TRUCK AGENTS WANTED
Commissions paid without the purchase
of demonstrator. If you have any pros-
pects send for catalogs and discounts, 1500
lb., 2000 lb., 3000 lb., 4000 lb. Four cylin-
ders. S. A. E. tires, all oversize. Ideal
Auto Co., Fort Wayne, Ind.

Why Dunk Way Pays.
1. We sell direct.
2. We have no branches.
3. We own our factories.
4. We buy in carloads.
5. We sell at small profits.
6. We supply everything.
7. We have repair parts.
8. We save you 50 per cent.
9. We have Radiators, etc.
10. We have accessories.
11. We have 29,973 customers.
12. We want you.
13. We want your address.
14. We are in Detroit.
AUTOPARTS MFG. CO.
Detroit, Mich.
No Branches. Beware.

BARGAIN—Two new and never used 34x4
Davis Armor, Model B, Tire Protectors.
Both cost \$54.00. Will take \$34.00. Have
no use for them. Disposed of my car before
"Armors" arrived. Speak quick. George J.
Eberwine, Marblehead, Ohio.

MAGNETOS.
AN UNUSUAL OFFER.
Bosch Magnetos\$25.00
Splittorf Magnetos 20.00
These are standard goods and we only
have 300. Send your check before they are
gone.
AUTOPARTS MFG. CO.
DETROIT, MICH.
(We have no Branches.)

AUTOMOBILE AGENTS.
I want local agents in every county in
the United States to handle a popular-priced
line of automobiles; a good name and repu-
tation for integrity counts more with us
than money or experience; if you have \$300
and can furnish bond, you can procure the
agency for our high-grade car and we will
furnish you with demonstrator. For full
particulars address
R. C. LEWIS.
Sales Manager, Box 55, Milwaukee, Wis.
BUSINESS OPPORTUNITY—Are in position
to manufacture any meritorious ac-
cessory on royalty basis. Our present
articles are leaders. Interested in nothing
but the best. Address B. C., care of Auto-
mobile Dealer and Repairer, P. O. Box 654,
N. Y. City.

A Message to Dealers.—In this issue
the Franklin Automobile Company of
Syracuse, N. Y., has a full page an-
nouncement which should be carefully
read by every dealer, garage owner and
automobile owner who is financially
capable of handling an agency. All such
readers are urged to fill out the coupon
accompanying the Franklin advertise-
ment. This coupon does not involve any
obligation whatever on your part, but it
puts you in touch with the special propo-
sition this company desires to make to
dealers, throughout the country. As this
advertisement may appear but once, our
readers are urged to cut the coupon out
promptly and send it in to the main of-
fice of this company at Syracuse, N. Y.
The quality of the Franklin car is so well

Mosler Spit Fire
Plugs
ARE THE BEST
A. R. MOSLER & CO.
P. O. BOX 4, M.
MT. VERNON, N. Y.



AUTOMOBILE OWNER
If you are tired paying
the usual high list price
for Auto Supplies, write
for our 35% catalog.

35% AUTOMOBILE SUPPLY CO.
97 Chambers St., New York.
1508 Michigan Ave., Chicago, Ill.
236 Peachtree St., Atlanta, Ga.

Moore Tire-Saving Jacks
\$6.50 Per Set of Four. 20,000 Sets in Use.
MOORE Jacks save tires by relieving
them of heavy weight of car. Easy
to apply—simply slip padded loop over hub
and press down lever. At dealers, or sent
prepaid on receipt of \$6.50.
J. C. MOORE & CO.
326 WISCONSIN ST. RACINE, WIS.

TWO CYCLE ENGINES!
"A short time ago I sent for and re-
ceived one of your THERMO-GASKETS
and I put it on a 3-cylinder, 17 horse,
Ferro burning distillate, and it gives
excellent satisfaction—at least 25%
improvement in the running of the
engine. I could dispose of a
large number in this vicinity."
F. W. BATTERSMALL & CO., ALBANY, N. Y.

Gardner
Garage Air Compressors
are fully described in our new
catalog just off the press.
Send for it and also ask for
our special proposition. It will
interest you.
THE GARDNER GOVERNOR CO.
Station R, Quincy, Ill.

known that comment is hardly necessary,
but it is a fact that an agency for this
car is a very desirable proposition.

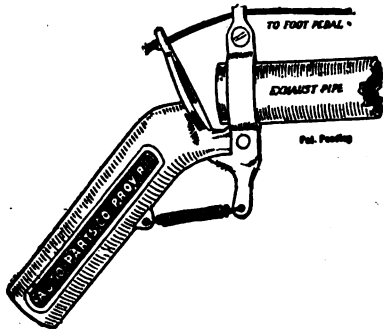
The Greenfield Tap & Die Corpora-
tion, a holding company that controls
the stock of the Wiley & Russell Mfg.
Co. and Wells Brothers Company, on
October 1st acquired the entire stock of
the A. J. Smart Mfg. Co. The A. J.
Smart Mfg. Co. was organized six years
ago and promptly established a name for
the manufacture of the highest class of
taps, dies and screw plates. The com-
pany will be continued as a separate
organization and conditions are ex-
tremely favorable for the continuation
of its very rapid growth. The new offi-
cers are: President, F. O. Wells; vice-
president, Rollin S. Bascom; treasurer
and clerk, F. H. Payne; directors, the
above, Wm. M. Pratt and J. W. Stevens.

O'Neil Inside Tire Protectors.—The
O'Neil Tire and Protector Company of
Akron, Ohio, say that their inside tire
protectors actually protect, thereby do-
ing away with 90 per cent. of the punc-
tures and blowouts. They are made of
five ply of specially woven material and
are very tough. The tensile strength is
1,600 pounds. This company says the
O'Neil protectors will increase mileage
100 per cent. and reduce tire expense 60
per cent. All these points are well worth
looking into. The company is making
a special offer just now and wants every
reader to write for it and mention this
paper.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



EXHAUST WHISTLE



Undoubtedly you have often felt the need of a long distance warning signal that could be operated without removing your hands from the steering wheel, and for 1913 we offer the APCO Exhaust Whistle, that has made good on thousands of cars all over the country during the past four years. The device is very simple, weighs a pound and can be put on your car in half an hour. There is nothing to get out of order, no back pressure, and it positively will not clog up, as no part of the Whistle comes in contact with the exhaust gases except when the Whistle is in use (most other Whistles are always in contact with the gas and therefore they are clogged up and inefficient half the time).

Remember, the APCO Whistle is not a musical instrument but a producer of real noise that will make the teamsters "sit up and take notice." Made for 1"—1¼"—1½"—1½"—1½"—1½"—1¾"—2" pipes back of muffler, and is furnished complete ready to attach, including brass pedal, cable and screws.

PRICE \$3.50 DELIVERED.

1½" to 2" SIZES 50c EXTRA

JOBBER AND DEALERS:

This is a live one. Write for prices, &c., to-day. We can make it worth your while to push the **APCO WHISTLE.** :: :: ::

AUTO PARTS CO.

:: ::

PROVIDENCE, R. I.

FROM

~~\$45.00~~

TO

\$25.00

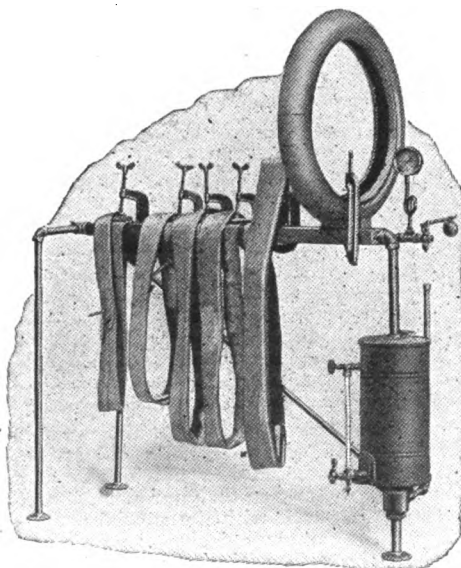
DOES THE PRICE SUIT?

Our Model F TUBE REPAIRING PLANT

we KNOW will suit you—now—nothing remains but the question of price and with one stroke we have cut that in two.

Realizing that the sale of a tube repairing plant does NOT interfere with the sale of our larger casing equipment we have decided to continue to produce the Model F solely as an OVER-HEAD REDUCER. Positively all profit has been cut off—nothing remains but factory cost.

CAN YOU BEAT IT?

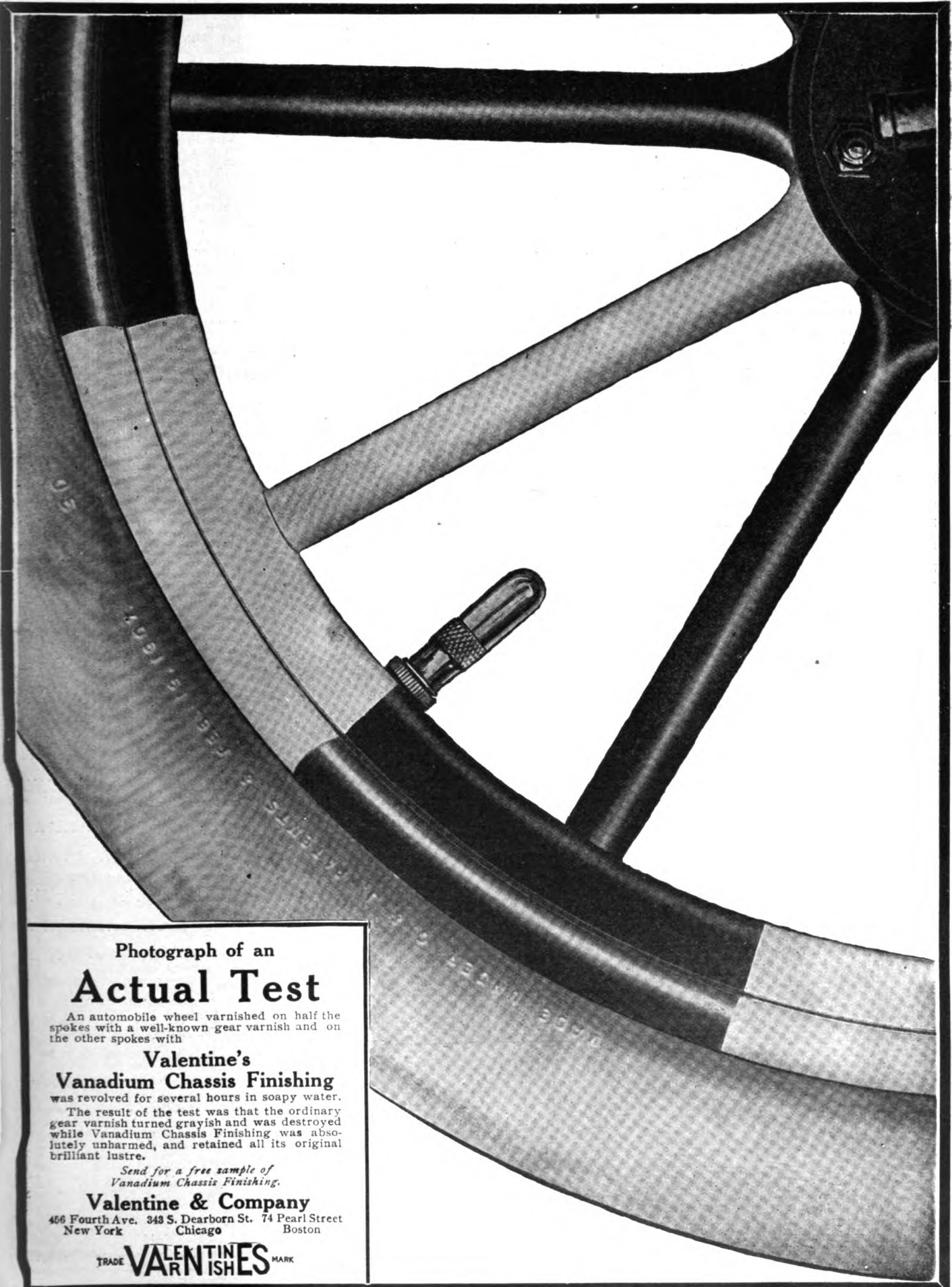


Model F HAYWOOD VULCANIZER

has been built without one mechanical change for five years. It is not a new vulcanizer; not an experiment; will not "revolutionize the industry;" it is just a good, honestly built, SAFE steam vulcanizing plant with plenty of tube-curing capacity and supplied with special plates for light casing work.

HAYWOOD TIRE & EQUIPMENT CO., 528 N. Capitol Ave., Indianapolis, Ind.

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Photograph of an
Actual Test

An automobile wheel varnished on half the spokes with a well-known gear varnish and on the other spokes with

**Valentine's
Vanadium Chassis Finishing**

was revolved for several hours in soapy water.

The result of the test was that the ordinary gear varnish turned grayish and was destroyed while Vanadium Chassis Finishing was absolutely unharmed, and retained all its original brilliant lustre.

*Send for a free sample of
Vanadium Chassis Finishing.*

Valentine & Company

456 Fourth Ave. 343 S. Dearborn St. 74 Pearl Street
New York Chicago Boston

TRADE **VALENTINE'S** MARK
VARNISHES

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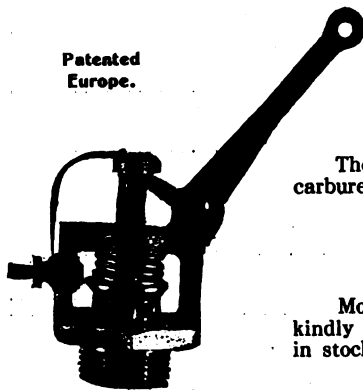
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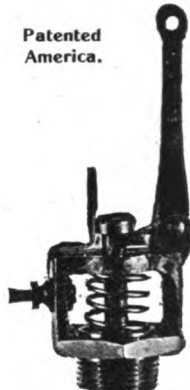
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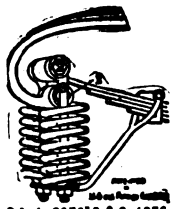
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THE HORSEY MANUFACTURING CO.,
6104 Euclid Ave., Cleveland, Ohio

pairing of automobiles in all of its branches. It has enlarged its electric and autogenous welding department and has installed a new system for doing electric welding. But consult their announcement on another page.

Stevens Auto Tire Valve.—This valve we understand has been adopted by Ralph De Palma, winner of the Vanderbilt cup at Milwaukee this year. It can be attached instantly, without expense, to any inner tube stem on any car. It is claimed that it will save one-half the time and labor necessary to inflate the tires by any other method. It is warranted not to leak. See the advertisement in this issue of the Stevens Manufacturing Supply Company, 1225 Wabash Ave., Chicago.

The Q. D. Rim Remover.—William L. Tobey, 9 Lewis Street, East Boston, Mass., who makes the Q. D. Rim Remover, is receiving a good many flattering testimonials from those who have used it. Here is one from W. B. Chittenden, Springfield, Ill. He says, "Will you kindly send me two of your Q. D. Rim Removers as I have a place for them? I am surprised that some of our local garage men do not get awake to this wonderful time saving device."

box if you want to. If you do not like them you can return the remaining 40 cigars at his expense and no charge will be made for the ten cigars you have smoked. If you keep the cigars you will be required to remit him the price of the cigars, \$2.50, within ten days. We don't see how any cigar manufacturer could make a fairer proposition than this and we believe a great many of our readers will want to take advantage of it. The writer knows that this particular cigar is a good one because he has smoked it for the last five or six years. In ordering be sure to state whether you want a mild cigar, a medium or a strong one. But read the advertisement on another page and then you will get all the particulars and can write intelligently. Don't fail to send your business card or give a reference when you order.

Jiffy Curtains.—There are curtains and curtains, but the Jiffy curtains have achieved such a reputation that any reader wanting a curtain should by all means investigate them. They can be attached to any car and it is said they can be manipulated without stopping your car or leaving your seat in a "jiffy." But consult their full page announcement in this issue and write for catalogue giving full particulars and prices.

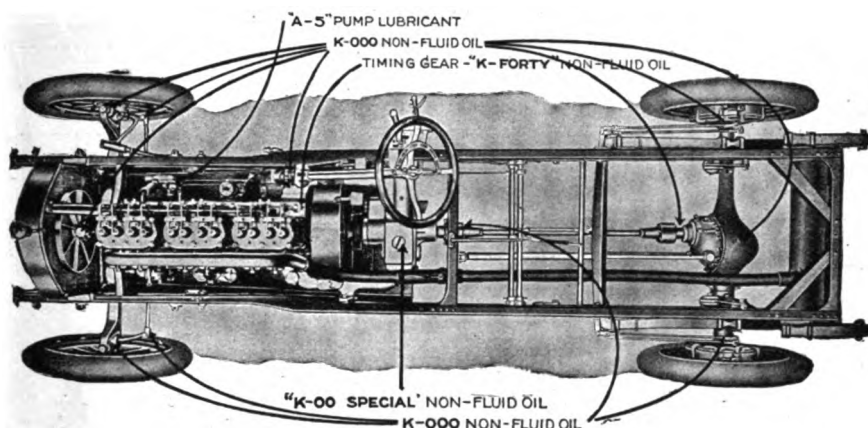
The Hub Machine Welding & Contracting Company of Philadelphia, Pa., has moved its factory to 22nd & Race Sts., where it has secured extended facilities for its rapidly growing business. This company has added a new department for the re-

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Not only does NON-FLUID OIL prevent wear by separating opposed bearing surfaces, but it reduces friction to such an extent that practically all the power of your engine is delivered to the driving wheels. No other lubricant is so absolutely wasteless. Every particle you apply is utilized for lubrication. Grease smeared gear cases, wheels and rear axles tell the story of waste when other lubricants are used. Ask your dealer for NON-FLUID OIL.

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F. J. Baker

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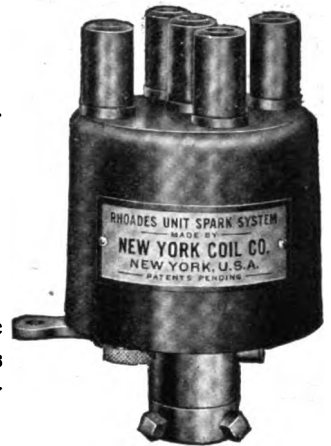
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SOLD IN FOUR DAYS 54 CARS

New 1913 Dayton Roadsters

REGULARLY SOLD AT \$1,250

AND THE BEST CAR IN ITS CLASS.

OUR PRICE \$585
F. O. B. Factory

Or delivery in New York City, with full equipment,
\$662.50

This is an extremely rare opportunity to get a high grade car at such a substantial reduction.

Everything used in the construction of this car is strictly standard and is infinitely superior to cars of the \$1,000 class.

JUST THINK OF A CAR WITH

Dual Ignition, Stromberg Carbureter, Selective Type Sliding Gear Transmission, Quick Detachable Tires, 32x3½; Fore Door Body, ¾ Elliptic Springs, Double Brakes on Wheels, Nickel Trimmings, at \$585.

Second Hand Cars

We must have room and ready cash to provide for still more new cars, so we are offering the remainder of our used cars at

"Wrecking" Prices.

They are all fine cars, in best condition. Among them are:—Packards, Peerless, Pierce, Marion, Buick, Stearns, Overlands, Reo, Chalmers, &c., &c.

BODIES, Inside Drive, \$150

Other, Lower Priced Ones.

BARGAINS IN MAGNETOS, MOTORS, FRAMES, TOPS, WHEELS, DEMOUNTABLE RIMS, LAMPS, WINDSHIELDS, TOOLS, all at 20c. to 30c. on the DOLLAR.

Tires At Cut Prices

32 x 4.....\$15.35; regularly.....\$29.25
36 x 4..... 17.00; regularly..... 32.30

All other sizes in proportion.

TIMES SQUARE AUTOMOBILE CO.

1710-1718 BROADWAY, 54th STREET

Telephone, 7366—Columbus

NEW YORK

Please mention the Automobile Dealer and Repairer when writing to advertisers.

THE \$10 — DAVIS PAT. LAP ROBE OF COMFORT



THE "STANDARD"
DAVIS ROBE



Price \$10, or in Fine, Thick, Soft
BABY BEAR FUR, \$20

NOW READY

Prepare for a **Comfortable** Autumn and Winter's motoring by ordering **Now** in **Either of the Two Models** Pictured herewith.

**FROM MAKER TO WEARER DIRECT—DELIVERED FREE AT YOUR DOOR
WITHIN TWENTY-FOUR HOURS FROM RECEIPT OF YOUR ORDER**

THESE MATCHLESS LAP-ROBES

are hand-made of our special weave, heavy triple fabric, wind and water proof mackintosh cloth (this cloth consists of two layers of linen whipcord with an inter-lining of pure rubber gum), in Oxford gray (by all means the handsomest and most serviceable color) tan or black colors, lined with heavy, imported, dark green plush. It has fancy braid and patent fasteners at the edges. The wearing portion under the feet is calfskin leather. These robes are "smart" soft and elegant in appearance.

Sent **EXPRESS PAID** on receipt of price, or **FREE** for examination to responsible people, on request.

Our Positive Guarantee

We hereby guarantee that these robes will retain **absolutely** the natural "furnace" heat of the body, keep out exterior cold and thereby keep the wearer **warm** and **Dry All Day Long** in **Any** degree of cold or storm, and if there comes a day so **Zero** cold that they fail to do it **WE WILL RETURN YOUR MONEY WITHOUT QUESTION.** For sale only by us. No agents.

This Advertisement Will Not Appear Again

until the Autumn of 1913—they cost a lot of money and we prefer rather to give our customers the benefit in **DAVIS ROBE QUALITY.**

Send for booklet concerning the time, trouble and money saving
DAVIS "ARMOR" TIRE PROTECTOR.

DAVIS ARCTIC OVER-PANTS



COVERS WAIST LEGS
AND FEET
ALL ONE PIECE

Send In-Seam Length. Price \$10.
Or in **BABY BEAR FUR**, \$30.

THE DAVIS ROBE & ARMOR CO.
10 N. STATE STREET CHICAGO, ILL., U. S. A.

Automobile Dealers Wanted To Act As Fox Typewriter Dealers—Sample at Wholesale

No other typewriter built—regardless of any claims made—is the equal of the new Fox Visible Typewriter, either in the material used or in workmanship, or in the number and convenience of its special features. There are many good typewriters being built and sold, but we claim for the new Fox Visible Typewriter that it is better than the best of these, and that its automatic features combined cannot be found in any other typewriter.

It has a Tabulator, Back Space Key, Two-Color Ribbon with Automatic Movement, both Oscillating and Reversing, and Removable Spools, Interchangeable Carriages and Platens, Card Holder, Stencil Cutting Device, Variable Line Spacer and Line Lock with Key Release. Its speed is fast enough for the speediest operator or slow enough for the beginner. It is extremely Durable and almost Noiseless.



WRITE TO-DAY FOR PROPOSITION

FOX TYPEWRITER COMPANY

6610-6620 Front Ave.

GRAND RAPIDS,

MICH.

AUTOMOBILE DEALER AND REPAIRER
INFORMATION COUPON

Name.....

Address.....

Business.....

Extra Income for Automobile Dealers

"The Prest-O-Lite Motorcycle Gas Tank is the ONLY practical light for motorcycles. It is the only one that makes night riding pleasant and SAFE."



Prest-O-Lite advertising is carrying this message to the motorcycle owners everywhere and building up big business for automobile dealers as well as motorcycle dealers both on installation and exchange.

This is a new and big opportunity—and it is getting bigger every day. There's a good profit in the sale of a Prest-O-Lite Motorcycle Tank and a steady source of income from the exchange business.

Put out a sign, "Prest-O-Lite Motorcycle Tank."

Our Liberal Loan Proposition applies also to motorcycle tanks, and makes it easy for you to have plenty of them on hand, with only a little money invested.

Write us about this.

THE PREST-O-LITE COMPANY, 251 East South Street, Indianapolis, Ind.

Branch Offices and Service Stations in all principal cities. Charging Plants in all parts of the country.
Extensive foreign service.

Exchange Agencies Everywhere

Please mention the Automobile Dealer and Repairer when writing to advertisers.



This photo taken at Indianapolis at the end of "Four States Tour" proves the perfect holding power of Interlock Inner Tires. After 10,000 miles use (attested to by largest tire makes) the Interlock held 80 lbs. pressure and the car weight, with the outer casing completely worn through in places as large as your hand.

INTERLOCK INNER TIRES

Stop Tire Troubles

Save Buying New Tires

They will carry your old tires through the fall and winter and make your new tires last about twice the usual mileage.

Why Interlocks are Needed

Most tires are thrown away before they are half actually worn out because of trouble with blow-out and fabric breaks.

The tire makers cannot prevent this waste or free you from the bother and annoyance of blow-outs, because any attempt to make your single fabric tires stronger by adding more plies in the building would cause the fabric to separate or pull apart.

What Interlocks Do

Interlocks provide that much needed extra fabric strength which will make any tire blow-out proof, practically puncture proof and capable of fully twice the ordinary mileage—at the same time they save half your tire expense—save repair bills and give you that freedom from tire trouble and perfect confidence in your tires which greatly increases the pleasure of motoring.

Nothing Else Like the Interlock

The Interlock is not an open edge inner shoe or a reliner, but a full round, complete, endless **inner tire** which pressure locks to the rim, therefore cannot heat or chafe. Being made in the exact size for each tire it is easily placed inside your present tire between the outer casing and the inner tube, and becomes practically a part of the outer casing. The Interlock is not a tire filler or substitute for air, but something which retains your present desirable and necessary features of **speed, full shock absorbing power, high resilience**, with practically no increase of wheel weight.

Proven by Every Test

Interlocks are used more widely than any other tire improvement. They are recommended by the largest automobile supply and tire houses, but most important of all, Interlocks have successfully stood the hardest and fastest kind of long tour road tests under the critical observation of tire experts.

To Dealers and Agents

Any agent by showing the Interlock to car owners do a large Interlock business. We have no county rights for sale, but we want a live dealer in each town, and give positive selling assistance. Write promptly for our proposition.

CAR OWNER'S COUPON

DOUBLE FABRIC TIRE CO., 18 W. 9th St., Auburn, Ind.

Please send me more information about Interlock Inner Tires.

Name.....

Street.....

City..... State.....

Dealer's Name.....

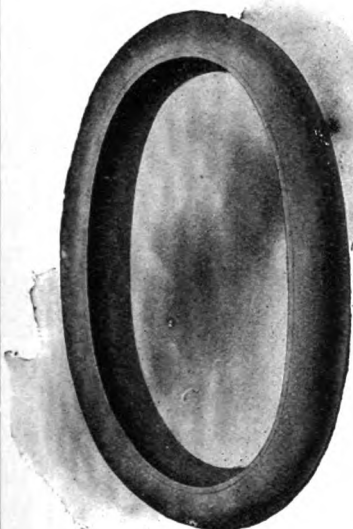
What Tires Do You Use?..... Size.....



Please mention the Automobile Dealer and Repairer when writing to advertisers.

O'NEIL Inside Tire Protectors Protect.

90% of the punctures and blowouts are unnecessary. You can avoid them by using O'NEIL Inside Tire Protectors. O'NEIL Protectors are scientifically made, of 5 plies of specially woven material. Very tough. 90% puncture proof. The tensile strength is 1600 pounds. That gives your tires 1600 pounds added strength. So blowouts are next to impossible.



The O'NEIL Protector will increase your tire mileage 100%, and reduce your tire expense 60%.

O'NEIL is the original inside protector, Patented April 27, 1909. It has stood the test 5 years. It is still the leader. Imitators have never equaled it.

Buy O'NEIL Protectors and have the original—the BEST.

Write for our
Special Offer

**The O'Neil Tire &
Protector Co.**

AKRON, OHIO.

The **Diamond** *Tire Sleeve*

is the only practical device on the market that will take care of any injury no matter how severe.

Fits over the casing and inside the rim. As good for rim-cut as for a large puncture or blowout on the tread.

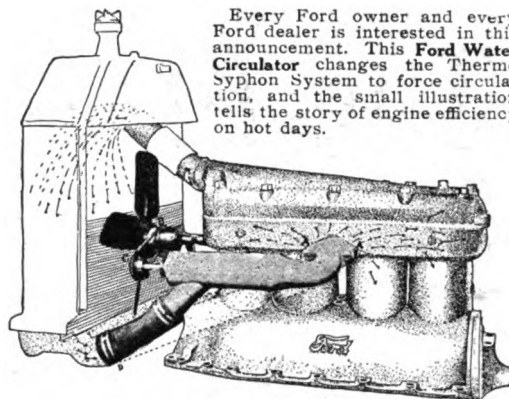
This and many other tire accessories are worth investigating.

A postal card will bring you a booklet describing them.

THE DIAMOND RUBBER CO. OF N. Y.
Akron, Ohio.

Subsidiary of The B. F. Goodrich Co.

Ford Dealers & Owners Read This—Then Act



Every Ford owner and every Ford dealer is interested in this announcement. This **Ford Water Circulator** changes the Thermo Siphon System to force circulation, and the small illustration tells the story of engine efficiency on hot days.

The Ford Water Circulator

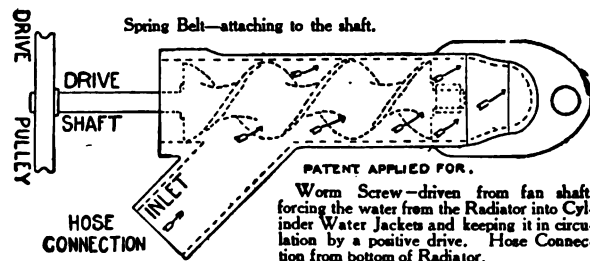
forces the water through the cylinder water jacket by the positive drive of the worm screw, insuring rapid circulation with mechanical pressure back of it, giving

A Cool Motor Always

The Ford water circulator can be installed in twenty minutes without boring or reaming. The worm screw shaft is driven off a split pulley on the fan shaft through a spring belt that snaps on in an instant.

Always in motion when engine is running—practically no excess power required to drive—does not impede circulation when motor is at rest.

**"FURNISH FORD OWNERS WITH THIS
COOLING SYSTEM"**



It saves engine wear and tear, promotes speed—saves repairs—economizes on oil—prevents carbon—comes to you ready to install—weighs but three pounds—cast aluminum.

PRICE \$12.50

Our Proposition Through the Jobber
Will Interest Live Wire Dealers

**The Fulton-McCutchan
Company**

1146 Michigan Avenue

Chicago, Ill.

Ford Owners
30 Days Only

Here is a
\$2.50
Coupon
For You

Mr. Dealer
and Mr. Jobber:

This coupon entitles the signers to a rebate of \$2.50 on the purchase price of a Ford Water Circulator. We stand behind it.

**THE FULTON-McCUTCHAN
COMPANY**

1147 Michigan Ave., Chicago, Ill.

Name.....
Address.....

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The Brake Lining That Made the Automobile Safe

The original and pioneer of all asbestos
Brake Linings.

Every worth-while improvement in Brake
Lining has originated with the makers of
RAYBESTOS.

Our watchword is quality and constant
improvement of RAYBESTOS.

Get the best—no other as good.

It costs the car owner no more.

The name RAYBESTOS
is stamped in every foot of
the lining.

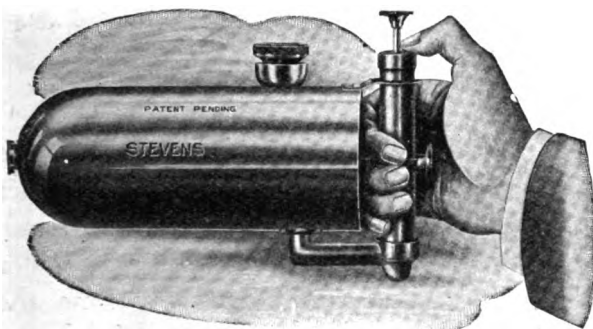
The Royal Equipment Co.

450 Housatonic Ave. Bridgeport, Conn.

We also make Duplex and Raymond Brakes and Gyrex, the Mixer.



Stevens Auto Cleaner



AUTOMOBILE OWNERS, GARAGES, MACHINE SHOPS, find this device indispensable. Saves hands and clothing and prolongs life of costly machinery by instantly removing grease, grit and dirt. After using this Cleaner, adjustment of an automobile is a pleasure. Can be used by Florists, Printers, Hospitals, Laundries, etc. Will deliver a fine spray or a dynamic stream.

Finished in solid polished and lacquered brass. Price complete with pump, \$6.00.

Stevens Auto Tire Valve

Adopted by RALPH DePALMA, Winner of the Vanderbilt Cup at Milwaukee, 1912. Can be attached instantly without expense to any inner tube stem, on any car. Saves one-half the time and labor necessary to inflate tires by any other method. Easily adjusted. Warranted not to leak.



200,000 in use. Send \$1.00 for set of four. Try them 30 days, and if not satisfactory, money will be cheerfully refunded.

Stevens Manufacturing and Supply Company,
1223-25-27 Wabash Avenue, Chicago, Ill., U. S. A.

This Tire Gauge FREE - - -

**Reduces Tire Costs
Increases Resiliency
Lessens Chances Of Puncture
Accurately Tells How Much
Air In Tires**

This unusual offer is made for the purpose of placing in every car owner's hands an



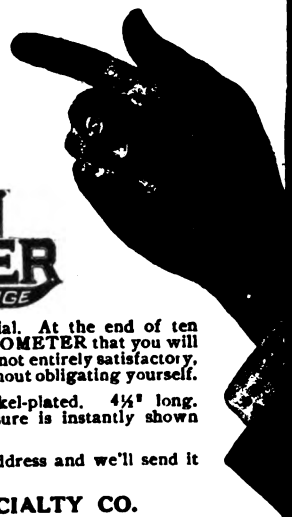
**ALLEN
TYROMETER**
TIRE PRESSURE GAUGE

We offer it to you for a Ten Day Free Trial. At the end of ten days you will be so pleased with the TYROMETER that you will gladly remit the price, which is \$1.00. If not entirely satisfactory, you may return TYROMETER to us without obligating yourself.

Absolutely accurate. Handsomely nickel-plated. 4 1/4" long. Has clip cap. Press on valve and pressure is instantly shown and held until you release sliding band.

Drop a post card with your name and address and we'll send it at once by mail.

THE ALLEN AUTO SPECIALTY CO.
Manufacturers of the famous Allen Tire Case.
1924 Broadway, New York.



Mr. TIRE REPAIRMAN:

Have you taken advantage of our Free Trial Offer No. 2 on

"AMERICAN" CEMENTS and REPAIR STOCKS?

If not, you are missing a splendid opportunity to see how good tire-repair materials can be made. Write us at once.

5 Minute Cure Vulcanizing Cement.

One Cement for every requirement.



Saves Time. Think how much more work you can do, how much time and money you will save, when your repairs cure in only 5 minutes.

Effective and Lasting. The cure is so quick, there is no danger of ruining the case or tube through over-heating. This Cement will withstand a continuous high temperature, hence heat leaks are practically impossible.

Economical. Repairs either cases or inner tubes. Carry only one kind of Cement in stock. For repairing other rubber goods it is just as superior to any other cement.

A generous sample goes with our Free Trial Offer No. 2.

EVERYTHING FOR THE REPAIRMAN

American Re-inforced Inner Tubes are double walled at the base, preventing bead pinching, the cause of most punctures. Splices are cured with our 5-Minute Cure Vulcanizing Cement, hence separation is impossible.

Complete line of Tread Stocks, Fabrics, Patches, Valve Pads, Sectional Air Bags, &c., &c. Fully guaranteed. Our RE-LINERS are made to get and hold your business. Ask us about them.

DON'T CONTRACT TILL YOU GET OUR FREE TRIAL OFFER No. 2
THE AMERICAN TIRE & RUBBER CO., AKRON, OHIO

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Going! Going! Gone!!

The Careless Expensive Way.



A New Tire

After 400 miles the tire is cut by a sharp stone or a piece of glass.



After 800 miles, the tire cut has been enlarged and one edge torn loose from the fabric.



After 1200 miles, the hole is still further enlarged and dirt has been forced under the tread forming a "sand-pocket."



After 1500 miles, the inner-tube has blown clear through the casing--throw it into the junk-heap

This first series of pictures shows the life of an average tire, *your tire*, under ordinary every-day treatment. A small cut, a little neglect, sand and water ground into the hole every time the wheel goes around, the result is always the same, rotted fabric and a ruined tire.

Next time you dig up \$40.00 for a new casing, just remember that it is money thrown away. The old tire might just as well have run 10,000 miles. The new one *will* run 10,000 miles if you vulcanize it with a

SHALER Vulcanizer

The Shaler Way.

Clean the cut with gasoline and sand-paper.

Fill the hole with Para Rubber.

Clamp on your Shaler Vulcanizer for a few minutes.

Result, a perfect weld of the old and new rubber. A blow-out avoided; tire as good as new.



This series shows the life of a tire taken care of in the *Shaler Way*. You or your chauffeur can do the work. The Shaler book of instructions explains every detail of the process perfectly.

Get a Shaler Vulcanizer, go over your tires once a month and seal the cuts and sand-pockets with new, live Para rubber. Rotting of the fabric, blow-outs, and other tire trouble will be eliminated. *You will make one tire outwear three.*

The Shaler is a complete outfit for tire repairs. It is the only vulcanizer with a temperature control that is *automatic*. No attention required after you put it on the tire. Best of all, you don't have to take the tire off the wheel--the job is done in less time than it requires to remove and replace a tire.

Get a Free Copy of this Book.

"Care and Repair of Tires" tells what you need to know about every tire emergency. A new edition is just off the press. We'll mail you a copy free if you ask for it while the edition lasts.

C. A. Shaler Co., 809 4th St., Waupun, Wis.

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It Has Come at Last! The New Automatic Air Chuck.

Just
what
you
have
wanted
for
a
long
time.



EDELMANN
AIR-CHUCK

Price \$1.00.

To open
press
down over
tire-valve.
When
you let
go it closes
automatic-
ally.

For Air Lines.

Made to last. Fits 1/2," 3/8" or 1/4" Air
Hose. Positively will not leak.

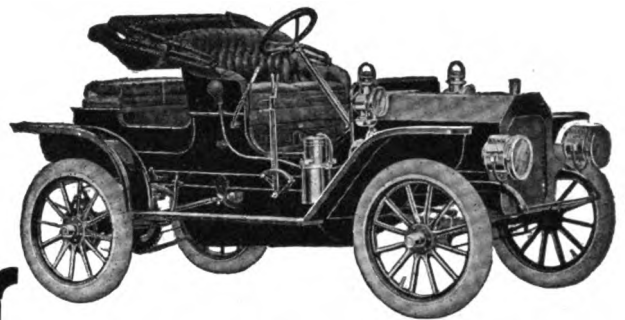
Your Money Back If Not Satisfactory.

DEALERS:—Send us 75c. in stamps and we
will mail you an Air Chuck by insured mail—prepaid
United States and Canada.

Air Chuck is heavy brass—all parts easily replaced—
nothing to get out of order.

E. EDELMANN & CO. LARGEST MANUFACTURERS OF
TIRE GAUGES IN THE WORLD
225 W. Illinois St. - - CHICAGO, ILL.

Send for our new tire gauge catalog.



A Free Book for Auto Repair Men

The **Auto Repairers' Guide & Price Maker** is
issued in the interest of automobile repairers, dealers
and garage men—it's free to the trade and sent
to them only.

Think of it, 480 pages of bargains—about 3000
illustrations—a complete auto repairers' guide and
price maker—quotes **lowest wholesale prices** on
first quality automobile supplies, auto repairers' tools,
tool kits, spark plugs, horns, lamps, pumps, springs,
forgings, brass fittings, batteries, coils, switches, auto
tops and in fact **everything used on an auto.**

*Write for your copy today, sending business card, letter-
head or some other evidence that you are in the trade.*

CRAY BROTHERS

JOBBERS AND MANUFACTURERS OF AUTO ACCESSORIES
1119-1123 W. 11th St., Cleveland, Ohio

EFFICIENT LUBRICATION

HARRIS

TRADE MARK REG. U.S. PAT. OFF.

OILS

Quality, not quantity, is the policy of the A. W. Harris
Oil Co. Therefore HARRIS OILS are ALL lubrication.
There is no waste. They are best for your car because
they give maximum lubrication. Use HARRIS OILS—
prove to your own satisfaction that there
is nothing else as good.



If your dealer does not sell Harris Oils,
send 80 cents for 1 gal. can, or \$3.75 for
5 gal. can, and we will ship same prepaid.

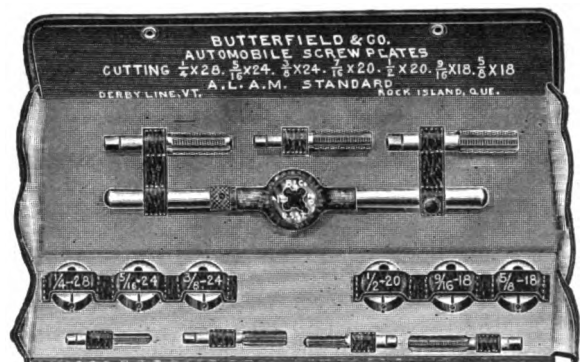
A. W. Harris Oil Company,

326 S. Water St., PROVIDENCE, R. I.
143 No. Wabash Ave., CHICAGO, ILL.

AUTOMOBILE and MOTORCYCLE

Repair Kits are incomplete without one of our
Thread Cutting and Cleaning Assortments.

In a GENUINE LEATHER ROLL.



The most complete and the most widely used
sets on the market to-day.

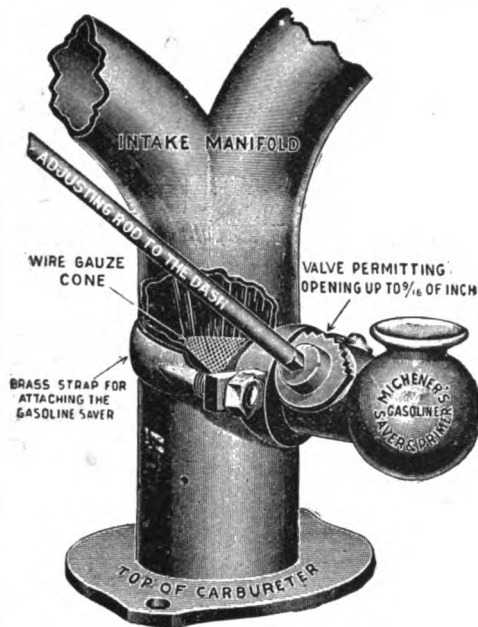
Send for Catalogue and Prices.

BUTTERFIELD & CO.

DERBY LINE, VT. ROCK ISLAND, CAN.

New York Store: 126 Chambers Street.

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MR. AUTOIST

You know that a carbureter adjusted for easy starting and low throttle will not give its highest efficiency and economy on higher engine speeds.

There is just one right mixture for each running condition of your motor, and the Michener Gasoline Saver and Primer, with its hand control from your seat while you are driving along, is the only right way to accomplish it.

The modern carbureter has to be adjusted so that all speeds will be equally well taken care of. If the carbureter were set so that the highest possible efficiency were obtained at high speed it would probably be impossible to start the engine. When a gasoline engine is

first started it requires a richer feed of gasoline than it does after becoming thoroughly warmed up. One of the most important factors in high engine speed is getting the gas into the cylinders with the least possible resistance. In some cases racing men have even taken the air valves out of the carbureter in order to cut down the resistance.

The Michener Gasoline Saver and Primer reduces the air resistance to a minimum, without sacrificing the starter and low speed adjustment. It breaks up and remixes the gasoline globules with a spray of air, increases the speed and saves gasoline.

When the Gasoline Saver valve is opened the engine draws in a spray of air through the wire gauze cone and as it strikes the gasoline globules rising from the carbureter, it has a tremendous mixing effect and you are enabled by means of the hand control to make the mixture perfectly homogeneous and in the correct proportions for developing the maximum economy and power.

High altitudes reduce the air taken in per stroke of the engine because of the barometric pressure causing an over rich feed, and different atmospheric conditions affect the mixture. Compensation for this is easily made with this device, and in the interests of clean plugs, clean cylinders, clean muffler, cool motor and economy of fuel the hand control enables you to give the leanest mixture possible.

OTHER POINTS

When Descending Grades you can leave the clutch in; close the throttle and open the Gasoline Saver valve **full**, allowing the engine to act as a brake, thus greatly saving the brakes of wear and strain; it scavenges and cools the engine; saves gasoline; keeps the car under perfect control and allows the operator a rest from the labor of operating the brakes. When the car begins to slow down at the bottom of grade, close the Gasoline Saver valve a little and the engine immediately takes hold without the least jar.

For Priming the Engine when it is hard to start, fill the Gasoline Saver bowl with gasoline and give the valve a small opening. When you crank, the intake stroke sucks the gasoline through the wire gauze cone, converting it into a rich perfect mixture which ignites instantly. Priming this way does not cut the lubrication of the cylinders, as is the case when gasoline is introduced (the old way) through gravity and priming cups. This is a great feature of this device.

By using this device you can give your carbureter a little richer feed for heavy pulling and easy starting because you are enabled to regulate the mixture from your seat, for speed and economy of fuel. The simple closing of the Gasoline Saver valve gives you the regular carbureter adjustment.

The engine cannot be started when the Michener Gasoline Saver valve is left wide open, and it forms an effective lock for the car against theft.

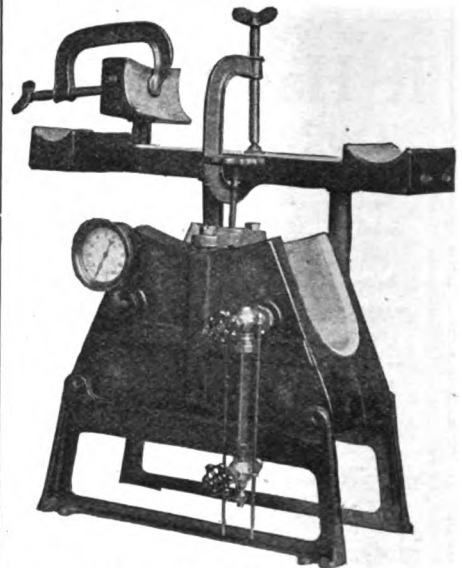
GUARANTEE:

The Michener Gasoline Saver and Primer is guaranteed to save gasoline, increase the speed on same amount of gasoline, to enable you to regulate the carburetion as you drive along for different load, speed and atmospheric conditions, and to be an infallible primer.

If after 30 days' trial it does not do all claimed, return it in good condition and your money will be immediately refunded. Reference: Citizens' National Bank, New Castle, Pa.

Write for Booklet of testimonials and further particulars.

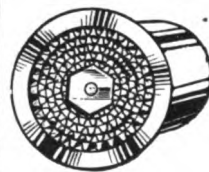
E. S. MICHENER - 800 Washington St., New Castle, Pa.



STEAM VULCANIZER No. 2. For 4, 4½ and 5 inch cases.

Equipped for gas or gasoline. Sold with or without the tube plate and case repair attachment. Our attachment covers a large range of work. Repair men can't afford to be without our Combination attachment.

VANDERPOOL TIRE & R. CO., Springfield, Ohio



Crone's Vaporizer

(To slip in manifold)

Saves from 50 to 75% on oil and gasoline. Gives more power to the car. Stops back-firing and makes the car run smoother.

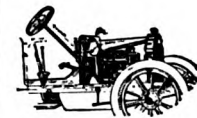
Give size of intake.

In Cold Weather the **CRONE PRIMER** will start the engine with one crank. No need of cranking an hour.

Write for Catalogue.

F. G. CRONE

Manufacturer of Primers, Valve Dressers and Vaporizers.
330 Genesee St., Buffalo, N. Y.

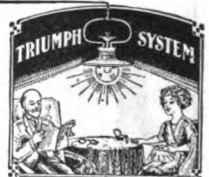


Hundreds of Auto Dealers sell these

Triumph Lights

System, Stand and Portable Lamps

and make good money on them. Why can't you?



A 300 Candle Power Shadowless Light, that can be turned up and down like gas, that anyone can install and operate.

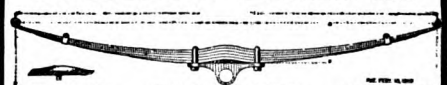
They meet all requirements of Home, Store, Church or business lighting, in or out doors, at less than half the cost of kerosene or electricity.

Write for A. D. R. catalog, it tells all about them.

BRILLIANT GAS LAMP CO.

Dept. 28. 182 N. State St. CHICAGO, ILL.

TITANIC SPRINGS

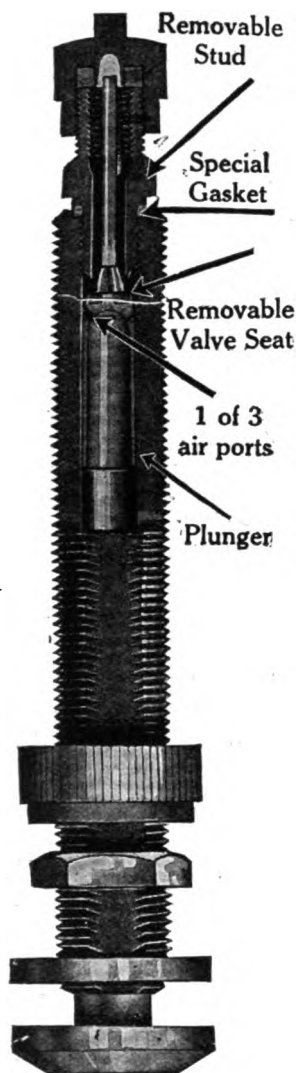


Suitable to all makes and models of cars. They go on any car like any other spring. Guaranteed absolutely. If broken through the center for any reason will replace at any time, and no questions asked. No center hole—the curved center and retaining plate hold the spring positively. No breakage—no hole to break in. Has already been tested on 3000 cars.

We Make All Other Styles of Springs

TUTHILL SPRING CO., 758 Polk St., Chicago.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



BURKE TIRE VALVES

**cut off two-thirds the time
and labor of tire pumping**

LABOR SAVING. When you inflate a 34x4 tire having Burke Valves you do away with *two tons* extra work now wasted on old-style spring closed valves. All because Burke Valves have *no spring resistance* whatever, to the charging pressure.

TIME SAVING. Burke Valves have three times the capacity to transmit air from pump to inner tube. They inflate or deflate in one-third the time.

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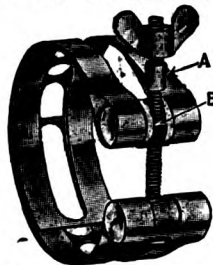
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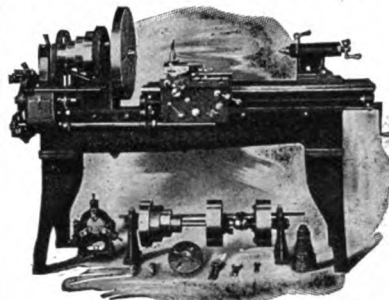
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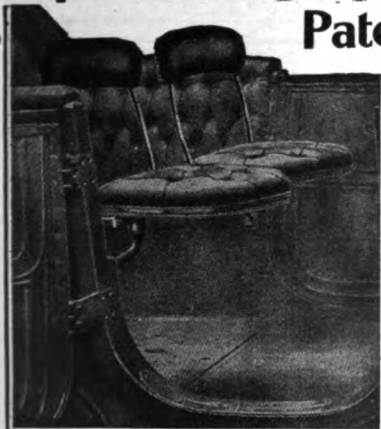
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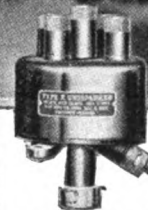
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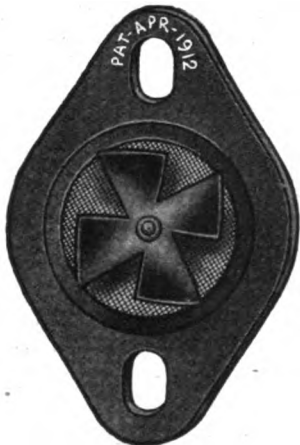
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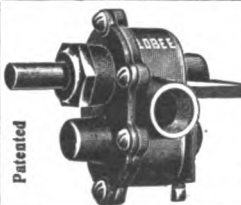
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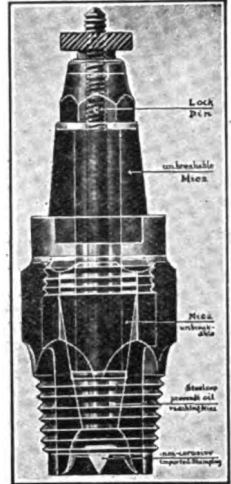
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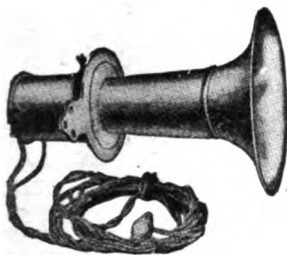
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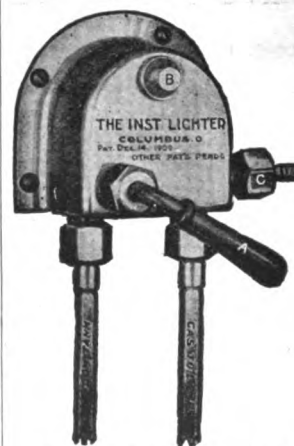
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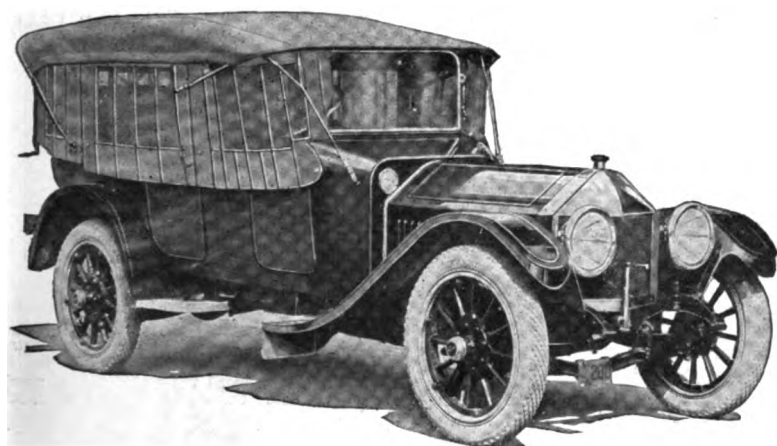
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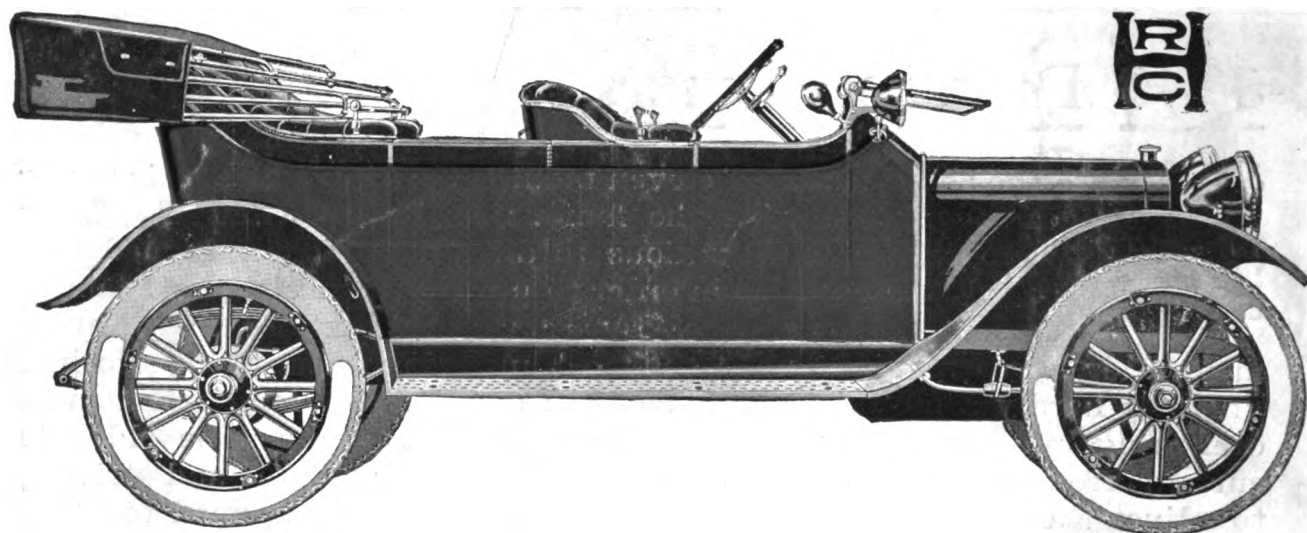
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\$900

F. O. B. DETROIT

The man who is in the market for a car at near the R-C-H price, and who does not buy an R-C-H, will not get equal value for his money, either in construction or equipment, anywhere else

In the first place, the R-C-H is built complete in our own great plants. The profits which makers of assembled cars pay to parts-makers are put into additional car-value in the R-C-H. The R-C-H introduced the left-side drive with center control and hand-brake in moderate-priced cars built in quantity. This increases the safety and convenience of automobile operation.

The R-C-H is exceptionally simple and easy for the beginner to learn.

The R-C-H has gained the nickname of "The Gum-Shoe Car" because it is so quiet.

Owners of R-C-H cars do not offend the public with clouds of smoke.

R-C-H cars are provided with large and small electric head lights. The strong lights, offensive to others, can be turned off on crowded thoroughfares.

They have soft-toned "Tally-ho" horns that do not offend pedestrians like other shrieking signals. R-C-H Cars do not have muffler cut-outs, which are exceedingly offensive to owners of horses, pedestrians and other automobilists.

The R-C-H does not leak oil on the roadway when left standing.

The car is easy to start—easy to steer.

The clutch throws out easily. Slight pressure on the brakes holds the car on the steepest hills. The foot or hand accelerator is flexible, enabling the car to travel from three to forty miles per hour and taking easily the roughest roads and steepest hills.

The R-C-H is famous everywhere as the easiest riding car.

The R-C-H smooth body surfaces and clean cut chassis design make it the easiest car to wash and keep spick and span. R-C-H accessibility makes the car the easiest to repair, and repair bills the smallest.

R-C-H prices on repair parts are the lowest quoted by any automobile manufacturer in the world.

The R-C-H is a most economical car in gasoline and oil consumption and gets great mileage from tires.

The R-C-H body is most comfortable and affords greatest protection from wind, rain and dust. The doors are wide and front seats have dash ventilators. There is ample room for three adults in the tonneau, and plenty of room lengthwise so that there is no cramping of the limbs.

The R-C-H introduced the long stroke four cylinder motor in popular priced cars built in quantity. It has done much to demonstrate that a long stroke four has all the desirable qualities of a six-cylinder motor, without the complicated mechanism, extra weight and lack of economy.

The R-C-H introduced Jiffy Curtains—one of the greatest inventions for the motorist's comfort.

The R-C-H introduced non-skid tires all around as regular equipment on automobiles, thereby making motoring safer, reducing chance of puncture and prolonging the life of the tires.

The R-C-H introduced the first high-grade speedometer ever used as regular equipment on moderate priced motor cars.

The R-C-H introduced the rich and durable red and black color combination as standard in quantity production of automobiles.

The R-C-H introduced the rear view mirror as regu-

lar equipment on automobiles, greatly aiding in the safety of automobile operation.

The R-C-H introduced the one-piece windshield, doing away with the useless lower glass and improving the vision.

The R-C-H introduced demountable and quick-detachable rims for moderate priced cars built in quantities.

The R-C-H is the chief exponent of high grade magnetos. More than 5000 Bosch magnetos now in use on R-C-H cars are giving perfect service.

The R-C-H introduced the straight-side, no-rim-cut tires—noiseless transmission gears—vibrationless motor.

The R-C-H has brought the moulding of gray iron to its greatest perfection. Over 5000 cars now in use have not produced one defective casting.

The R-C-H worked out the use of drop forgings to the greatest degree, adding greatly to the strength and durability of the car.

In over 5000 cars now in use in which are assembled one million drop forgings, there has not been one single case of defect.

Two Passenger Roadster, 110 inch wheelbase, \$900, f. o. b. Detroit.

Three Passenger Coupe, 110 inch wheelbase, \$1300, f. o. b. Detroit.

THE CAR

The best materials, the highest-grade workmanship, and the most up-to-date ideas in construction.

Wheelbase—110 inches.

Motor—Long stroke; 4 cylinders cast en bloc; 3¼ inch bore, 5 inch stroke. Two-bearing crank shaft. Timing gears and valves enclosed. Three-point suspension.

Steering—Left Side. Irreversible worm gear, 16-inch steering wheel. Throttle control on steering column.

Control—Center Lever operated through H-plate integral with universal joint housing just below. Hand lever emergency brake at driver's right. Foot accelerator in connection with hand throttle.

Springs—Front, semi-elliptic; rear, full elliptic and mounted on swivel seats.

Frame—Pressed steel channel.

Axles—Front, I-beam, drop-forged; rear, semi-floating type.

Transmission—Three speeds forward and reverse sliding gear, selective type.

Construction—Drop-forgings wherever practicable. chrome nickel steel used throughout all shafts and gears in the transmission and rear axle, high carbon manganese steel in all parts requiring special stiffness.

Body—Full 5-passenger English type; extra-wide seats.

EQUIPMENT

The most complete, highest-grade equipment ever placed on a popular-priced car.

Non-skid tires—32x3¼.

12-inch Hall Bullet electric head lights with double parabolic lens.

6-inch Hall Bullet electric side lights with parabolic lens.

Exide 100 Ampere Hour Battery.

Bosch Magneto.

Warner Auto-Meter.

Demountable rims.

Extra rim and holders.

Tally-ho horn.

Jiffy curtains—up or down instantaneously.

Top and Top cover.

Windshield.

Rear view mirror.

Tool-kit, Jack, Tire Repair Kit, Pump.

Robe Rail.

Ride with us in this wonderful car and judge it for yourself.

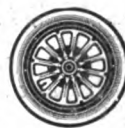
Demonstration by appointment at your convenience.

R-C-H CORPORATION, 191 Lycaste Street, Detroit, Michigan

Branches

ATLANTA, 548 Peachtree St.; BOSTON, 563 Boylston St.; BUFFALO, 1225 Main St.; CHICAGO, 2021 Michigan Ave.; CLEVELAND, 2122 Euclid Ave.; DENVER, 1520 Broadway; DETROIT, Jefferson Ave. and Lycaste St.; KANSAS CITY, 3501 Main St.; LOS ANGELES, 1242 So. Flower St.; MINNEAPOLIS, 1206 Hennepin Ave.; NEW YORK, 1989 Broadway; PHILADELPHIA, 330 No. Broad St.; SAN FRANCISCO, 819-835 Ellis Ave.; WALKERVILLE, ONT., CANADA.

Automobile Dealer and Repairer



A JOURNAL OF PRACTICAL MOTORING

REGISTERED IN U. S. PATENT OFFICE.

THE MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Vol. 14, No. 3.

NEW YORK, NOVEMBER, 1912.

Monthly, \$1.00 per year.
Single Copy 10 Cents.



The tread that makes the brake effective

In situations like this, your safety depends upon the co-operation between your brakes and the treads of your tires.

No matter how good your brakes are *you don't stop* if the treads of your tires don't respond by gripping the road. "All the 'brakes' are with you" when your car is equipped with

Goodrich
SAFETY
TREAD **Tires**

The Safety Tread takes orders from the brakes, gets busy and brings the car up standing. The first bar to touch the street pushes the ooze out of the way, and keeps it away while the other bars get a good grip on the clean spot under the tire.

This new Safety Tread tire solves the skid by removing the cause. It is a Goodrich Tire thru and thru. It has Goodrich Quality, Goodrich Unit Construction and Goodrich Tough Tread—only more of it. It delivers mileage in Goodrich heaping measure.

100 branches and service stations and innumerable dealers everywhere can now supply you with this new Safety Tread, in any size and to fit any rim.

THE B. F. GOODRICH CO.,

AKRON, OHIO

THE LARGEST IN THE WORLD.

Weatherproof Your Auto-Top! You can renew its appearance and make it weather-proof with

"F-S" "Evernew" Auto-Top Dressing

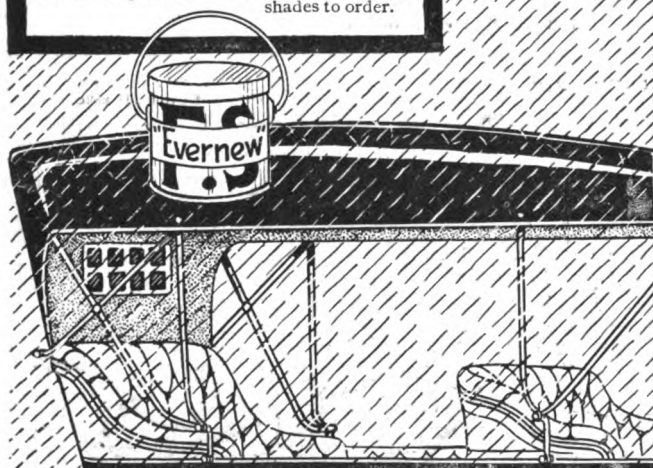
Easily applied—dries quickly—non-injurious. Eight standard colors—special shades to order. Write for color-card and prices.

FELTON, SIBLEY & CO., Inc.

Manufacturers Paints, Colors, Varnishes,
136-140 N. FOURTH ST. PHILADELPHIA

"Evernew" Auto-Top Sizing for first coat on mohair, cloth or canvas tops that have never been painted.

"Evernew" Auto-Body Enamel in colors to correspond with our "Evernew" Auto-Top Dressing. Special shades to order.



The Diamond Tire Sleeve

is the only practical device on the market that will take care of any injury no matter how severe.

Fits over the casing and inside the rim. As good for rim-cut as for a large puncture or blowout on the tread.

This and many other tire accessories are worth investigating.

A postal card will bring you a booklet describing them.

THE DIAMOND RUBBER CO. OF N. Y.
Akron, Ohio.

Subsidiary of The B. F. Goodrich Co.

Trahern Garage Pump

For
GASOLINE

Utility—Construction—Reliability

A Trinity of essential qualifications guaranteeing the Trahern Gasoline Pump to Garage Owners and to all buyers interested in a

Strictly High Grade Gasoline Pump

Each pump is thoroughly tested and properly inspected before shipment, thus insuring satisfaction when the pump is installed.

All working parts are of simple and practical construction.

Nothing to Get Out of Order

Every Garage Owner should investigate it.

Write for full information and prices.

Manufactured by
Trahern Pump Co.
Rockford, Ill.

Fig. 386

PERFECT LUBRICATION

HARRIS

TRADE MARK REG. U.S. PAT. OFF.

OILS

QUALITY is the keynote of HARRIS OIL manufacture. The basis is the highest quality Pennsylvania Crude stock—there is nothing better. Every process of making HARRIS OILS is carefully watched. Every drop is tested. HARRIS OILS are preferred and used by motorists who have had bitter experience with "ordinary" lubricants.

A. W. HARRIS OIL COMPANY,
326 S. Water St., PROVIDENCE, R. I.
143 No. Wabash Ave., CHICAGO, ILL.



A Snow-and-Ice Tire Tread!

You have wanted a better traction device to give your tires a grip in snow and ice.

You have formerly used chains—under protest. They are unhandy, noisy, short-lived, expensive.

You would like to get the **results** without the added cost of chains. If you found something that **saved more than its cost**, by **REDUCING** tire wear (instead of increasing it), you would think mighty hard before turning it down!

Here It Is 

The tried and proven **WOODWORTH TREAD**, with an added series of high rivets to give a grip on ice and in deep snow. These rivets are tempered glass-hard. They are deeply cupped, to give sharp edges when worn. They are set staggered about 2 inches apart, all around the tread.

The rest of the tread is the same as before. Same waterproof, always-pliable chrome leather base; same side springs to prevent loosening and chafing; same rows of hardened rivets between the special high rivets.

Just put the Double Grip Treads on your tires and leave them on all winter! They give traction anywhere, and you are saved the nuisance of putting on and taking off chains.

Save your tires, your purse, and your car by using the new

Double Grip
Woodworth Treads

Our nearest distributor will be glad to quote prices and answer your questions. Or write to us direct, mentioning this magazine.

LEATHER TIRE GOODS COMPANY
NIAGARA FALLS, N. Y.

New York Store, 1608 Broadway

Good agents wanted for unoccupied territory.



Please mention the Automobile Dealer and Repairer when writing to advertisers.

SPECIAL TO ADVERTISERS

Our next Regular Issue (December Number, 1912,) will be the Annual

NEW YORK SHOW NUMBER

of Automobile Dealer and Repairer,

Guaranteed Circulation

32,000 Copies

This issue will be mailed to all our regular subscribers, whether CAR OWNERS, DEALERS, GARAGE OWNERS or REPAIR MEN, in ample season for you to make New York Show announcements.

In addition this number will be extensively distributed to exhibitors, both in Madison Square Garden and Grand Central Palace during the Pleasure Vehicle section of the New York Automobile Show; and we shall exhibit and demonstrate this publication and receive subscriptions in both exhibition buildings.

To be included in this great Special Number, we must have your order with copy **immediately**. Do not neglect the matter and lose this exceptional advertising opportunity.

FIRST FORMS CLOSE DECEMBER 1st, 1912

No advertising for New York Show Number can be accepted after December 5th, 1912.

We give you the benefit of

LOWEST YEARLY RATES

for space in this Number.

The best way for you to secure space is to wire your order, telegraphic charges at our expense.

DO IT NOW

or you may be too late.

Address telegrams or other communications to

MOTOR VEHICLE PUB. CO.,

71-73 Murray Street

NEW YORK CITY

MOTT'S Patent "Pressure" FOR VULCANIZING Far Better than AIR BAGS



With these "Pressures" you get more solid cure because you have more pressure and absolutely no danger of blow-outs or spoiled work. No air, springs, or mechanical devices used; last a lifetime and the price below that of best air bags; no experiment, tested, used and guaranteed thoroughly.

Price COMPLETE, 3 to 5 1/2 inch \$60

CIRCULAR ON REQUEST

**RICHARDSON TIRE CO.,
HARTFORD, CONN.**

Darn that leaky radiator!

No; don't darn it, it's no sock.

Pour in Se-Ment-Ol

Finds leak—fixes it—
fifteen minutes.

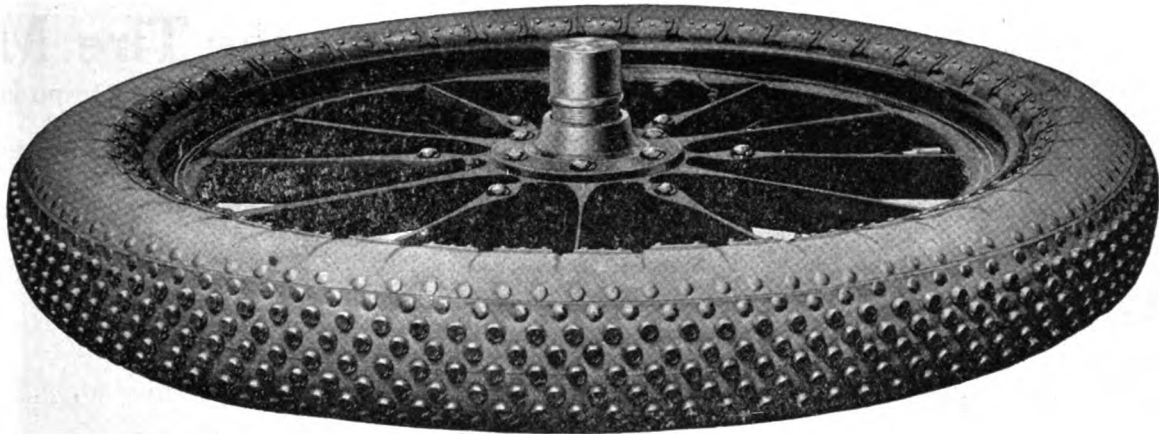
Cost nominal;
result PHE-
nominal.

SE-MENT-OL
"CHEMICALLY CORRECT"

Make a
boon companion
of Se-Ment-Ol
on your motor trips.

It will save you many a
sigh and many a simoleon.
Price 75cents at dealers.

THE NORTHWESTERN CHEMICAL CO.
Marietta, Ohio.



Guaranteed 5,000 Miles Without Puncture

Whether Your Tires are New or Old

If your tires are tread-worn or rut-worn, don't throw them away or you'll throw away \$50 to \$200. Durable Treads will make your tires wear 10,000 miles instead of 5,000.

Our Written Guarantee

With Durable Treads we will give you a written legal Guarantee for 5,000 miles without puncture. This is binding whether your tires are new or old, tread-worn, rim-cut or rut-worn.

Durable Treads are the only protectors built to actually protect your tires against rim-cuts, rut-wear and side blow-outs.

This is the broadest Guarantee ever given with a tread. We are able to give it because Durable Treads are making good every day on thousands of cars, under all sorts of conditions.

It protects you absolutely—you cannot lose.

No More Punctures or Road Delays

Your tire expense this winter will be tremendous. Frozen rough roads will puncture and ruin your unprotected tires.

But if you will protect them with Durable Treads you can travel over the worst roads.

For tire troubles, expenses and road-delays are guaranteed absolutely impossible with Durable Treads.

On slippery pavements—in crowded streets—you can control your car. For there will be no slipping or skidding with Durable Treads.

Tire Expenses Reduced Half

Your tire expense without Durable Treads is 1½ to 4 cents per mile. It is greater than your cost of gasoline and oil combined.

With all punctures, blow-outs and repairs eliminated it will drop to less than half. This vast saving should pay for the entire maintenance of your car each season.

And each season you will not need to pay \$50 to \$200 for a new set of tires. Durable Treads will capacitate your old ones for 5,000 miles more without puncture.

Durable Treads

Cost Half of Tires

A set of tires cost \$50 to \$200. But Durable Treads cost less than half those amounts. Hence, isn't it economy to protect your tires? And isn't it more economical to buy Durable Treads at half the cost of tires?

Exclusive Features

Extra heavy tread strip covers wearing surface, adding 50 per cent to life of protector.

Three to five miles of Tire Fabric prevents stretching or sagging.



Exclusive Features

Hardened steel rivets, closely set on tread surface, prevent skidding.

Full leather cover protects tire from cuts and side blow-outs.

Nickel steel rim-attachment places driving strain on wheel, instead of on worn, weakened tires. It also prevents rim-cuts and side blow-outs.

Forcing Recognition

The increasing sales of Durable Treads is appalling—100 per cent each month. Durable Treads are forcing their way to the front through merit alone.

Car owners are awakening to the fact that Durable Treads will save them that 1½ to 4 cents a mile. And they want it.

Durable Treads should soon become part of the standard equipment.

COLORADO TIRE & LEATHER CO.

1208 Majestic Bldg., CHICAGO

1027 Broadway, DENVER, COLO.

Special Discount

If Durable Treads are not already represented in your territory, we will make shipments direct to you from factory and allow you our full dealer's discount on your initial order and make you an exceptional dealer's proposition.

This is to introduce them. It is an excellent opportunity for you to equip your car at almost cost.

It must be taken immediately, for territories are rapidly being filled.

Test At Our Expense

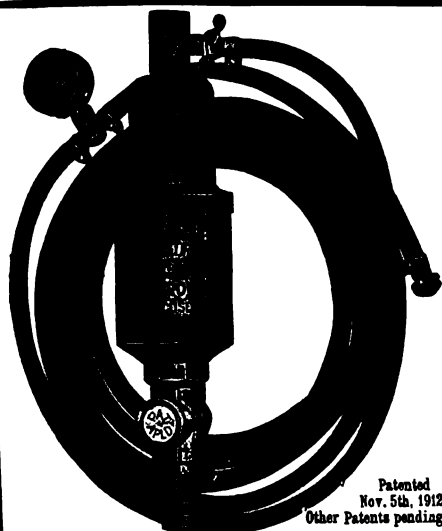
We want you to know just what Durable Treads are before you invest a cent or promise to buy. We will ship you a pair or full set with your permission, for inspection. We will pay the express. The examination will cost you nothing.

We have explained to you without exaggeration what Durable Treads will do. We guarantee every statement in this advertisement.

Now we want you to send the coupon below for conclusive proof. If you live East of the Mississippi, address Chicago; if West, address Denver.

SEND COUPON FOR PROOF

COLORADO TIRE & LEATHER CO., 1208 Majestic Bldg., Chicago. 1027 Broadway, Denver, Colo.	
Dear Sirs:—Please send us proof about Durable Treads without obligation or expense to us.	
Name.....	
Street Address.....	
City.....	
My tire sizes are:.....	



Put One Over on the Tire Man

Prolong the life of your tires by using a Brown Impulse Tire Pump.

You know that tires wear longer when they are properly inflated. And you know it is always difficult and often impossible to get proper inflation with a hand pump.

The Brown Impulse Tire Pump is the only pump that automatically inflates and automatically registers the air pressure.

It's simple, substantial, carefully made. There is economy and satisfaction in owning one.

Ask your dealer or write us for full information.

THE BROWN COMPANY

1100 So. Clinton Street,

Syracuse, N. Y.

Patented
Nov. 5th, 1912.
Other Patents pending.



SECURITY

Self-Vulcanizing Patches Are True to Name

To prove our self-vulcanizing statement we ask you to remove if possible a Security Patch after a few miles of service. They make permanent repairs, same as if made on a steam vulcanizer.

Be sure you ask your dealer for
Security Self-Vulcanizing Patches
Auto Set, 15 Patches Complete, \$1.00
Motorcycle Set, 12 Patches Complete, 50 Cents

The Security Co.
25 Shingliss Street :: Pittsburgh, Pa.
Stock carried at San Francisco office, 788 Mission St.

Packard

CABLE

— FOR —

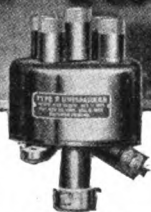
ELECTRIC LIGHTING & STARTING SYSTEMS
MAKES GOOD WITH A VENGEANCE.

As Does Also OUR FAMOUS IGNITION CABLE.
Make that Repair Job PERMANENT.

Complete Stock For Immediate Shipments. Our wire awaits your wire.
ABSOLUTE SATISFACTION GUARANTEED.

THE PACKARD ELECTRIC COMPANY, 329 Dana Ave., WARREN, OHIO.

The Atwater Kent Ignition System



For every kind and make of motor—a system ideal in efficiency, simplicity and reliability.

Write today for booklet G

Atwater Kent Mfg. Works
4933 STENTON AVENUE PHILADELPHIA, PA

Invader Gear Oil Puts Noisy Gears to Sleep

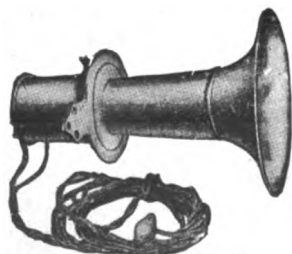


This is a fluid lubricant. It is always uniform, 100% oil of the same strength, contains no water or chemicals. Will not foam in the case when running or rust bearings when remaining idle. It is a stronger and more economical lubricant than any grease made, including our own.

Sold in ten pound, twenty-five pound and fifty pound cans.

Chas. F. Kellom & Co. 113 Arch St. Philadelphia
New England Branch, 284 Columbus Ave., Boston

NEWTONE SUPERIOR



Motor Driven

The First Efficient Motor
Horn to sell at a
popular price

Price \$10

Guaranteed by the largest Auto
Horn Manufacturers in
the world

Automobile Supply Mfg. Co.
220 Taffe Place, BROOKLYN, N. Y.



GUARANTEED to
repair cuts in shoes
or punctures in tubes
without heat or vul-
canizing.

Ask your jobber.

SET, \$1.50

CHAS. O. TINGLEY & CO.
RAHWAY, N. J.

This startling photograph shows the difference in resisting qualities between ordinary varnishes and

Vanadium Chassis Finishing

It is our automobile wheel exhibit at the Shows. It is varnished on half its spokes with a well-known gear varnish, and on the other spokes with our Chassis Finishing. It is then revolved for several hours in soapy water. The ordinary gear varnish is destroyed. Chassis Finishing is absolutely unharmed. It is the *only* varnish that resists soapy water, mud, road oil, etc.

*Send for a free sample of
Vanadium Chassis Finishing.*

Valentine & Company

456 Fourth Ave. 343 S. Dearborn St. 74 Pearl Street
New York Chicago Boston

TRADE **VALENTINE'S** MARK
VARNISHES



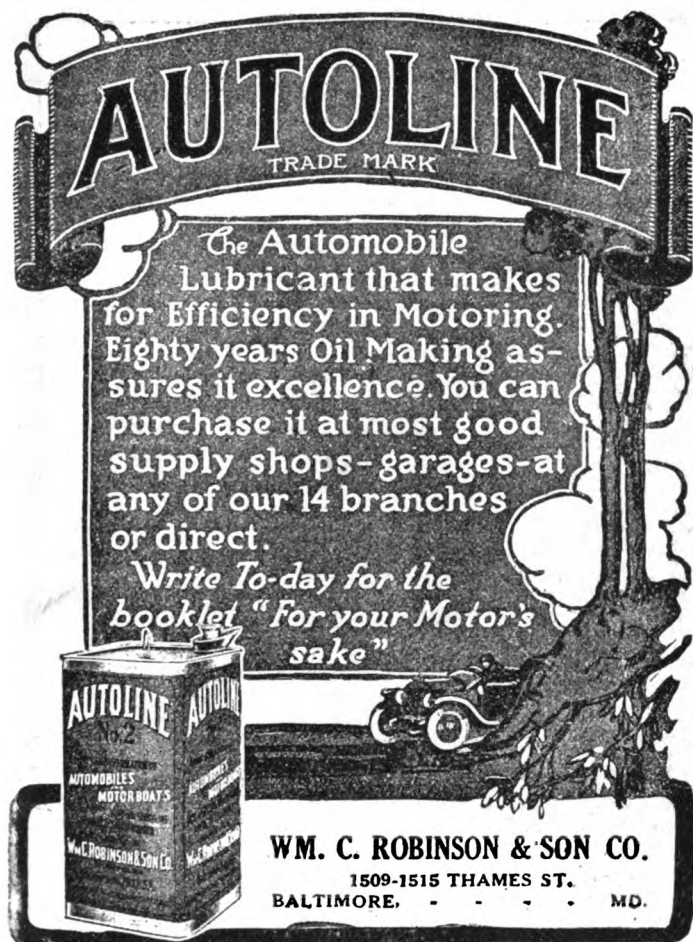
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AUTOLINE

TRADE MARK

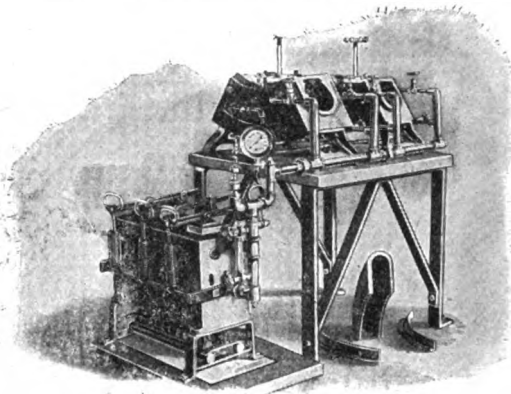
The Automobile Lubricant that makes for Efficiency in Motoring. Eighty years Oil Making assures it excellence. You can purchase it at most good supply shops - garages - at any of our 14 branches or direct.

Write To-day for the booklet "For your Motor's sake"



WM. C. ROBINSON & SON CO.
1509-1515 THAMES ST.
BALTIMORE, MD.

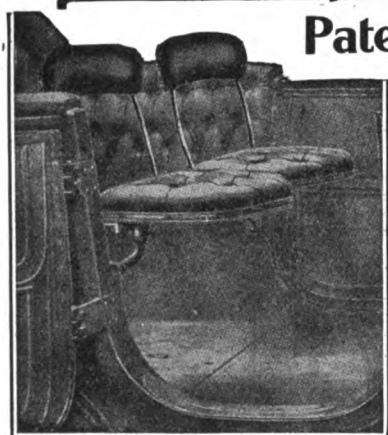
Tire Repair Men Are Making Money. Are You?



A tire repair plant, which requires only a small investment, is a sure and big profit maker. Every motorist in your vicinity is a probable customer. He is paying someone else to repair his tires. Why not you?

Write for Catalog 121, which tells of the equipment used in the tire factories and successful repair shops.

THE WILLIAMS FOUNDRY & MACHINE CO.
Glendale Ave., Akron, Ohio.



Patent Luxury Folding Seats

Made from steel drop forgings; artistic in design and finish; compact, rugged and durable.

A necessity of high grade car equipment.

Write for catalog showing various models.

Hodge & Graves Co.
AMESBURY, MASS.

WELDING AUTOMOBILE PARTS



Cracked or Broken

Cylinders, Crank Shafts, Crank Cases, Housings, Frames, Axles, any metals of any shapes or thicknesses, including

ALUMINUM PARTS

All work absolutely GUARANTEED

Manufacturers of welded (seamless) gasoline and oil tanks.

Write for estimates.

Complete Oxy-acetylene Welding and Cutting Plants Installed.

Western Welding & Mfg. Co., 557 & 559 W. Jackson Boulevard, Chicago, Ill.

AUTOMOBILE

Bodies, Chassis, Wheels, Steering Devices, front and rear Axles, Steel Rims, etc.

GET OUR PRICES AT ONCE.

BORBEIN AUTO CO.



2109-2111 N. 9th Street,
ST. LOUIS, MO.

DOVER AUTO FUNNELS ARE THE STANDARD

56 Sizes and Styles



SEND FOR 1912 CATALOGUE.

DOVER STAMPING AND MFG. CO.
CAMBRIDGE, MASS.



Send This Dealer Application

No matter what cars you *now* handle—get the Franklin Dealer Proposition. Franklin is now the third largest selling high priced car, and gaining rapidly on second.

Franklin cars are easy to sell because they (1) use less gasoline, averaging 20% to 35% more mileage per gallon; (2) use less oil, averaging 400 to 600 miles per gallon, without smoke; (3) use fewer tires, averaging 8,967 miles per set, the 1911 record; (4) travel faster in the long run, owners thinking little of making 200, 250, 300 miles and more per day, without fatigue; (5) ride easier, bowling along so smoothly and comfortably, without jolt or jar, that driver and occupants do not realize that they are steadily traveling 30, 35, and 40 miles per hour; (6) and wear longer than other cars, many Franklin cars giving their owners continuous satisfactory service for 5, 6, 7 and 8 years.

We will send full particulars of the Franklin Dealer Proposition to any automobile dealer, garage owner or automobile owner financially capable and with the business experience to become a successful dealer, provided he will mail us this "dealer application" immediately.

The sending of this application does not obligate the sender or us. It is merely a convenient way to get at the facts.

THE FRANKLIN LINE

D Touring, 6 cylinder, 38 H. P., 5 passengers.....	\$3500	M Little Six, Thirty, Touring, 5 passengers.....	\$2800
D Torpedo-phaeton, 6 cylinder, 38 H. P., 4 passengers.....	\$3500	M Little Six, Thirty, Victoria- phaeton, 2 passengers.....	\$2800
H Touring, 6 cylinder, 38 H. P., 7 passengers.....	\$3750	G Touring, 4 cylinder, 25 H. P., 5 passengers.....	\$2000
H Limousine, 6 cylinder, 38 H. P., 7 passengers, 5 passengers in- side.....	\$4750	G Runabout, 4 cylinder, 18 H. P., 2 passengers.....	\$1650

FRANKLIN AUTOMOBILE COMPANY
Syracuse, New York

DEALER APPLICATION

FRANKLIN AUTOMOBILE CO., Syracuse, N. Y.

Without obligating me please send your "Dealer Proposition" as advertised in November issue Automobile Dealer and Repairer.

Name

Address.....

Available
Capital.....

References
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I handle the following cars:

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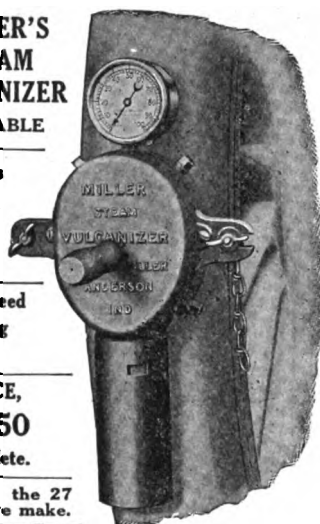
MILLER'S STEAM VULCANIZER PORTABLE

**Repairs
Casings
and
Tubes.**

**Guaranteed
Nothing
Better.**

PRICE,
\$7.50
Complete.

**One of the 27
kinds we make.**



Innerliners in one piece 100 ft. long, 3 or 4 ply, 50c. per lb., less 5% for cash.

MILLER'S TIRE RELINERS—4 PLY ADHESIVE—EXTRA QUALITY

Net Prices—Cash with Order 5 per cent. off

Net Price—Cash Price		Order's per cent. off.	
Each	Each	Each	Each
26 1/2" inches.....	\$1.95	31 1/4	.....\$3.20
28 1/2	" 2.30	32 1/4	" 3.60
30 1/2	" 2.55	33 1/4	" 3.90
32 1/2	" 2.75	34 1/4	" 4.15
34 1/2	" 2.95	35 1/4	" 4.35
36 1/2	" 3.20	36 1/4	" 4.60
38 1/2	" 3.40	37 1/4	" 4.80
40 1/2	" 3.60	38 1/4	" 5.00
42 1/2	" 3.85	39 1/4	" 5.15
44 1/2	" 4.10	40 1/4	" 5.40
46 1/2	" 4.35	41 1/4	" 5.65
48 1/2	" 4.60	42 1/4	" 5.90
50 1/2	" 4.85	43 1/4	" 6.15
52 1/2	" 5.10	44 1/4	" 6.40
54 1/2	" 5.35	45 1/4	" 6.65
56 1/2	" 5.60	46 1/4	" 6.90
58 1/2	" 5.85	47 1/4	" 7.15
60 1/2	" 6.10	48 1/4	" 7.40
62 1/2	" 6.35	49 1/4	" 7.65
64 1/2	" 6.60	50 1/4	" 7.90
66 1/2	" 6.85	51 1/4	" 8.15
68 1/2	" 7.10	52 1/4	" 8.40
70 1/2	" 7.35	53 1/4	" 8.65
72 1/2	" 7.60	54 1/4	" 8.90
74 1/2	" 7.85	55 1/4	" 9.15
76 1/2	" 8.10	56 1/4	" 9.40
78 1/2	" 8.35	57 1/4	" 9.65
80 1/2	" 8.60	58 1/4	" 9.90
82 1/2	" 8.85	59 1/4	" 10.15
84 1/2	" 9.10	60 1/4	" 10.40
86 1/2	" 9.35	61 1/4	" 10.65
88 1/2	" 9.60	62 1/4	" 10.90
90 1/2	" 9.85	63 1/4	" 11.15
92 1/2	" 10.10	64 1/4	" 11.40
94 1/2	" 10.35	65 1/4	" 11.65
96 1/2	" 10.60	66 1/4	" 11.90
98 1/2	" 10.85	67 1/4	" 12.15
100 1/2	" 11.10	68 1/4	" 12.40
102 1/2	" 11.35	69 1/4	" 12.65
104 1/2	" 11.60	70 1/4	" 12.90
106 1/2	" 11.85	71 1/4	" 13.15
108 1/2	" 12.10	72 1/4	" 13.40
110 1/2	" 12.35	73 1/4	" 13.65
112 1/2	" 12.60	74 1/4	" 13.90
114 1/2	" 12.85	75 1/4	" 14.15
116 1/2	" 13.10	76 1/4	" 14.40
118 1/2	" 13.35	77 1/4	" 14.65
120 1/2	" 13.60	78 1/4	" 14.90
122 1/2	" 13.85	79 1/4	" 15.15
124 1/2	" 14.10	80 1/4	" 15.40
126 1/2	" 14.35	81 1/4	" 15.65
128 1/2	" 14.60	82 1/4	" 15.90
130 1/2	" 14.85	83 1/4	" 16.15
132 1/2	" 15.10	84 1/4	" 16.40
134 1/2	" 15.35	85 1/4	" 16.65
136 1/2	" 15.60	86 1/4	" 16.90
138 1/2	" 15.85	87 1/4	" 17.15
140 1/2	" 16.10	88 1/4	" 17.40
142 1/2	" 16.35	89 1/4	" 17.65
144 1/2	" 16.60	90 1/4	" 17.90
146 1/2	" 16.85	91 1/4	" 18.15
148 1/2	" 17.10	92 1/4	" 18.40
150 1/2	" 17.35	93 1/4	" 18.65
152 1/2	" 17.60	94 1/4	" 18.90
154 1/2	" 17.85	95 1/4	" 19.15
156 1/2	" 18.10	96 1/4	" 19.40
158 1/2	" 18.35	97 1/4	" 19.65
160 1/2	" 18.60	98 1/4	" 19.90
162 1/2	" 18.85	99 1/4	" 20.15
164 1/2	" 19.10	100 1/4	" 20.40
166 1/2	" 19.35	101 1/4	" 20.65
168 1/2	" 19.60	102 1/4	" 20.90

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Net Prices—Cash with Order 40 and 5 per cent. off List Prices. Can Furnish Any Size Not Mentioned.

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Standard Tread Stock, per lb.	\$.70
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Cement Stock for Tubes	1.75
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No. Cement Patches, per dozen packages	2.50
No Cement Patching Rubber, sheet form, 1 lb.	2.00
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Fabric Cotton Tire Cloth, 18 ounces, one or two sides	.65
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Pure Fine Para Gum, for making cold cure or Cold Patching Cement	2.00
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This stock repairs casings and tubes and makes cement, and eliminates the necessity of carrying a large variety of repair material.

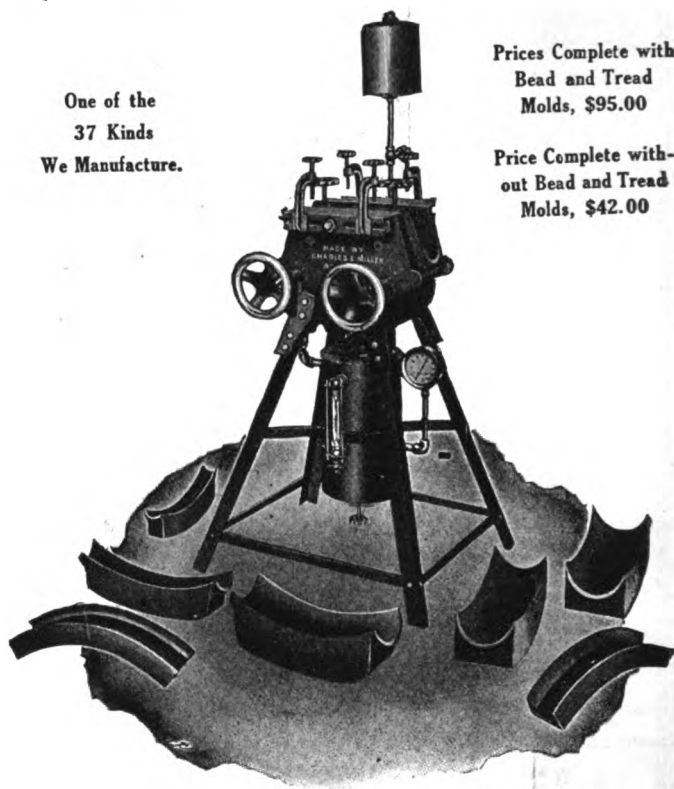
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The kind that repairs everything in the Tire line—all sizes of bicycle, motor cycle, auto and aeroplane tires, also 4 to 6 inner tubes at one time. Made and designed by the man who originated and patented the Cavity Vulcanizer, so generally used throughout the world.

One of the
37 Kinds
We Manufacture.

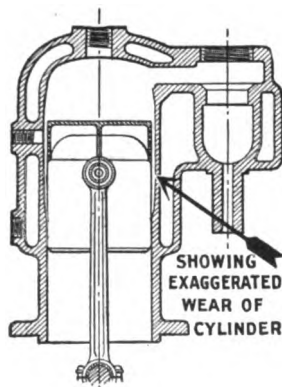


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The cylinders must have a true bore and well-fitting pistons and rings. Other parts of your automobile may be in the finest possible condition, but if the cylinders have worn larger in diameter or have been scored your motor cannot develop full power.

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It's like having a new machine.

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When you get tired of swearing at Tire Troubles, try "Bricton" Tire Treads. You'll swear by "Bricton Treads" to the end of your motoring days.

3 Years
29,000 Miles
Not Worn Out Yet

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All Kinds of Repairing a Specialty.
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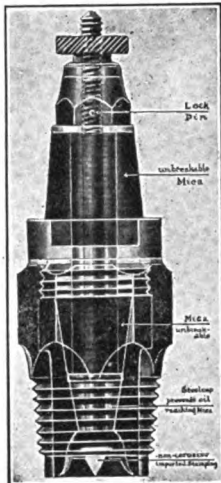
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ATTENTION!

A New Extraordinary Offer
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Send us your old, worn-out plugs of any make, and for each one of these old plugs we will make you an allowance of 50 cents on the purchase of a NEW Monarch Magneto Plug. Of course, this is an advertising plan to introduce our plugs to new users. At this rate you get these at half price.



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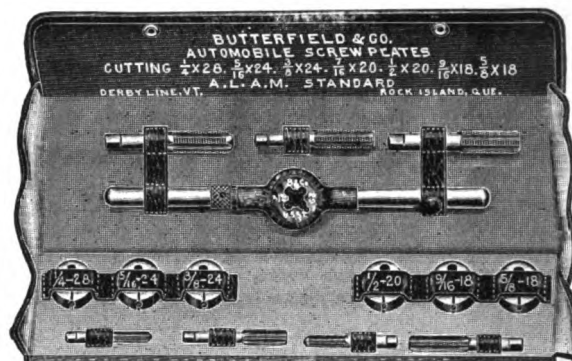
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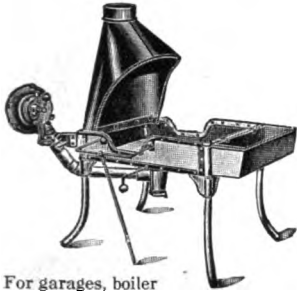
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For garages, boiler makers, horse shoers or any first-class forge shop.

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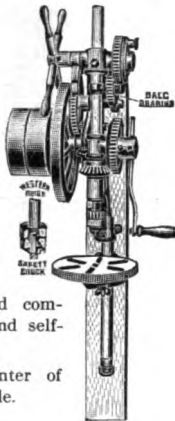
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Drills to center of 16 1/4-inch circle.



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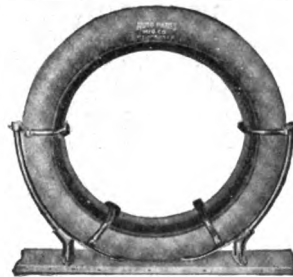


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Badger Side and Rear End Holder will take one or two tires or demountables of any size.

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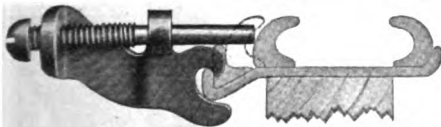
Running Board Holder, Patented Feb. 27, 1912.
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clears inside of Shoe. Screw the bead ring off locking ring. It holds the rings apart, leaving both hands free to remove the locking ring. Nickelled and case hardened, it weighs 2 1/4 oz. If not carried by your dealer, mailed prepaid in the U. S. on receipt of 65c P. O. or EXPRESS MONEY ORDER, or 75c on personal check, by

Hook the tool over the outer edge of tire rim, between the two ends of locking ring. Push valve stem into rim so that locking lug

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Cut Notch in Pipe and Clamp over it.

There's Nothing Better.
Price, \$1.50 to \$2.50.

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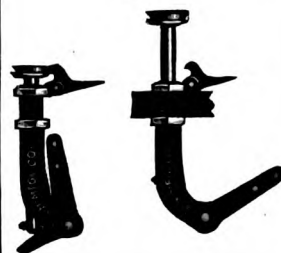
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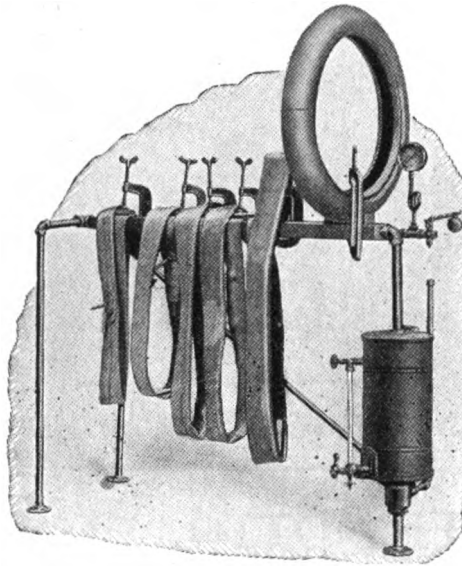
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**Our Model F
TUBE REPAIRING PLANT**
we KNOW will suit you—now—
nothing remains but the question
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have cut that in two.

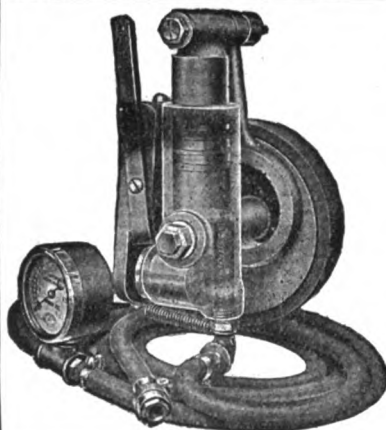
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we have decided to continue to pro-
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HAYWOOD VULCANIZER**
has been built without one me-
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It is not a new vulcanizer; not
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TEN EYCK AUTOMATIC TIRE PUMP

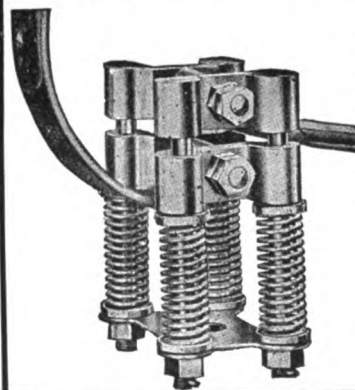
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merely attaching the
hose to the tire.

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VELVET AUXILIARY SPRINGS



Will make your car ride as soft
and easy as a

Velvet Cushion

either with light or heavy
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You can attach in a few min-
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No machine work or special fit-
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WRITE US—Giving name and
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Sold for cash, on 15 days' trial.

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"PATENT" RELINERS

K & W Dandy and Light Weight Reliners, Inside Patches,
Outside Boots, Tire Flaps, Adhesive Blowout Patches, K & W
Reliner and Para Patching Cements, Cementless Tube Patches
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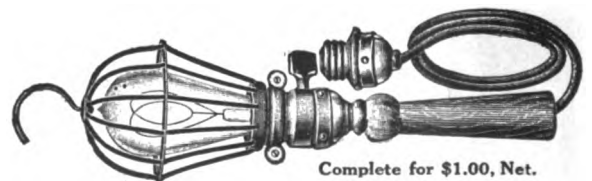
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K & W MFG. CO.

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You need THE EVERSFAE many times daily—you can use it under
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Complete with 10 ft. cord and plug ready for use.

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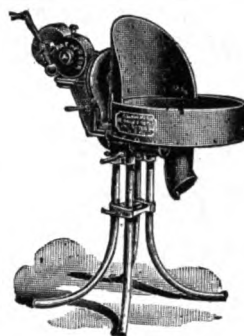
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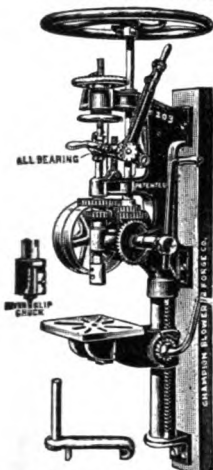


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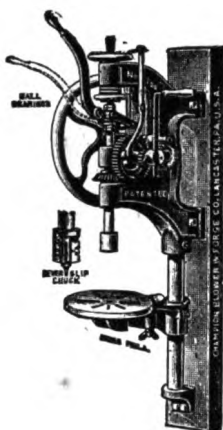


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Made with Ball Bearings only. With the Lever or Automatic Self-Feed 95 per cent in Time and Labor is saved by the instantaneous raising of the Drill Bit out of the hole just bored and again replacing the drill bit back on the material ready to bore the next hole. Remember—There is NO TURNING BACK of the Screw NUT with EITHER FEED.

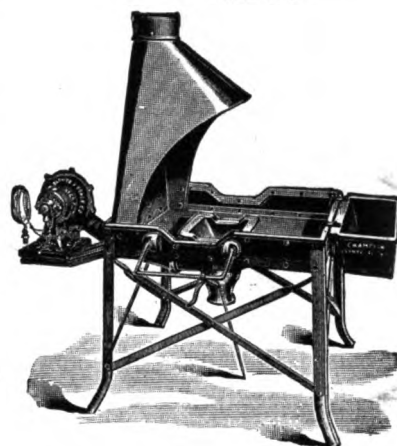
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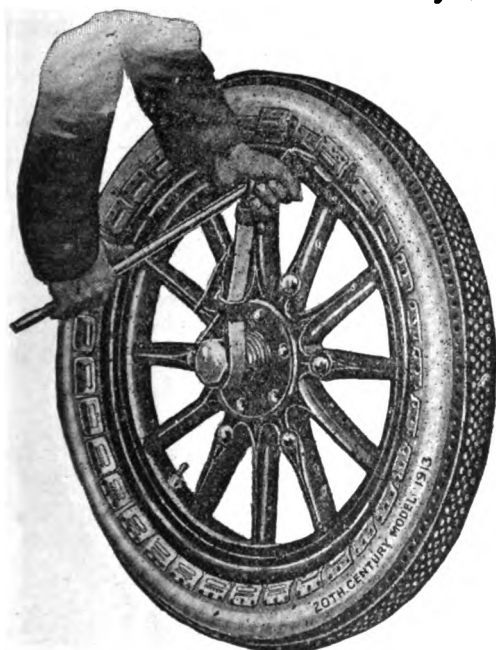
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No more SKIDDING
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Gentlemen:—Please send me full information and price with Certificate of 5,000 Miles guarantee of your Model 1913 Protector.
My tires are.....
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All that the name implies

**POWERFUL
SOOTLESS
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Prime your engine and clean your plugs at the same time.

**Price
\$1.50 each**

Designed and constructed for use with high or low tension magneto and battery ignition systems.

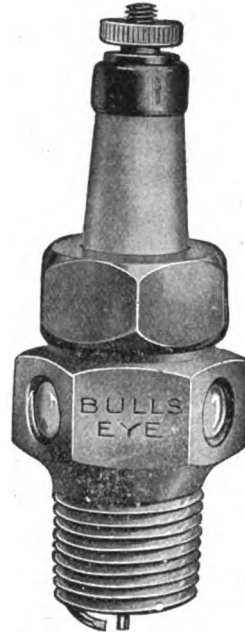
Made to fit any engine

We shall prosecute vigorously all infringements now on the market or any which may spring up in the future.

Frontier Specialty Company
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BULLS EYE SPARK PLUG

"The Plug with the Crystal Ports"



Shows at a glance dead cylinders and imperfect combustion.

Aside from special features the best made spark plug on the market.

Ports guaranteed against breakage.

Order a set from your dealer or from us. \$1.25 each, charges prepaid on receipt of price.

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Have a Genuine "Hagstrom" Porcelain Guard Spark Plug With Our Compliments.

"Don't Envy a Smooth Running Motor. Use Hagstrom Spark Plugs and Have One."

**This Non-Conductive
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Alone Worth
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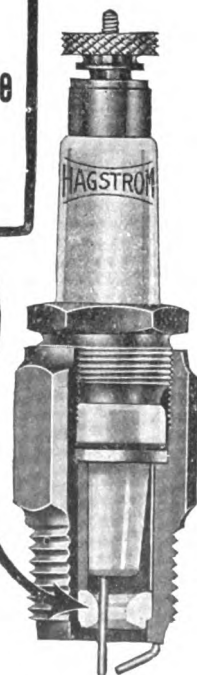
Cut out this ad.—fill in the blank—stuff it in an envelope with a \$1.00 bill, and 8c. postage, and you'll receive two plugs at the price of one.

Your money back if the "Hagstrom" is not the most satisfactory plug you ever used on a Ford, or any other car.

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Address

Size Plugs



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THIS little book was written especially for beginners. Either the man who uses an engine for pleasure or profit, but who has not time to study a technical book.

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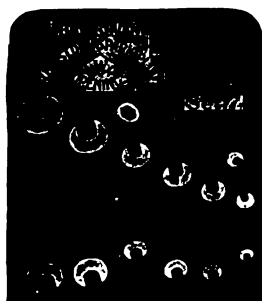
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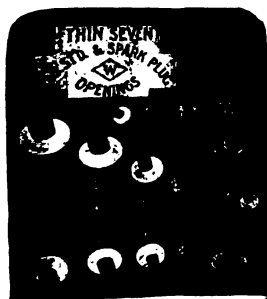
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"Thin Six"
For lighter service



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For lighter service

Why do manufacturers' quotations on wrenches vary, so greatly! The answer is, they don't! No specification which you or anybody else ever made has been complete. All the prices you ever received on wrenches differed only on the thing


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You do specify sizes precisely; everything else should be quality.

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Why not have the Vulcanizer you've paid for?

Yes, paid for it time and again. Not in cash perhaps, but in tire service that you might have had but didn't get.

You know what happens when you let a casing cut gather dirt and water for a hundred miles. The fabric, that ought to be protected by the tread, rots, and you have a blow-out that ruins the tire. It may cut five thousand miles from the life of an otherwise sound casing.

Vulcanizing is the only way of making casing repairs that are **permanent**. Unless you have a vulcanizer of your own, casing cuts will never get any attention. They don't look important enough to turn over to a garage for repair. With your own vulcanizer, if it's a

SHALER
VULCANIZER

all that's necessary is to prepare the cut, clamp the vulcanizer over it (tire inflated all the while), and leave it there to work by itself. The automatic heat control takes charge of the job, saving your time for other work about your car. In a few minutes you have a repair that is actually **welded** into the substance of the tire. No amount of wear will ever loosen it. The cut is sealed forever and deterioration of the fabric is prevented.

Tube repairs are easy too. You can vulcanize them at home easier and quicker than you can fix them any other way. The Shaler way of tire repairing is so simple that anyone can master it in a few minutes' time. You can't make a poor repair if you follow the directions furnished with the vulcanizer.

*Ask for a Free Copy of
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It contains a lot of valuable repair kinks, ideas that will help you get more miles from your tires, and full information about Shaler vulcanizers for garage and roadside use.

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"BEST KNOWN VULCANIZERS ON EARTH"

GARAGE SIZE. Vulcanizes three tubes and two casings at a time. Heated by gas or gasoline. Everything furnished complete, with liberal credits to you. List price \$50.00. Discounts to dealers and garages.

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It Has Come at Last! The New Automatic Air Chuck.

Just
what
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for
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When
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Price \$1.00.

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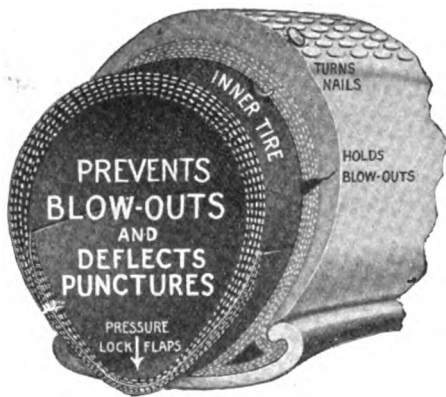
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DEALERS:—Send us 75c. in stamps and we will mail you an Air Chuck by insured mail—prepaid United States and Canada.

Air Chuck is heavy brass—all parts easily replaced—nothing to get out of order.

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Thousands of motorists are discarding inner shoes, reliners, fillers and other tire reinforcements for Interlock Inner Tires. They prevent Blow-outs, Punctures and tire trouble—double your tire mileage and save half your tire expense. We guarantee absolute satisfaction to users, without the slightest reservation.

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The WATRES Power Whistle is operated by burned gas from the engine stored in a small reservoir to which the whistle is connected. A touch of the foot pedal operates the whistle and the blast echoes a mile ahead.

Operated by stored power, the WATRES signal is always available. Coasting down hill or around corners or even with car stopped, the power is there—ready for a touch on the pedal.

We sell the WATRES Whistle on a definite guarantee—satisfaction or money back after thirty days' trial.

Send at once for Booklet giving full particulars and price.

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We also make above equipment for motor boats. Send for special booklet.

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That's what you get—three times the wear out of your tires—when you have an

M. & M. Repair Kit

With this complete time, tire and money saving repair outfit you can quickly and permanently repair any slit, any tear, any puncture, any blowout—in any casing or inner tube.

This cold process of repairing is much better, cheaper and quicker than heat vulcanizing. Does not overcure the rubber, take away the resiliency of the tube, weaken it or make it more susceptible to blowouts like heat vulcanizing.

This cold process of vulcanizing is used by all tire concerns to splice inner tubes. Hence its practicability. We guarantee repairs when made according to directions.

PRICE COMPLETE, \$1.00

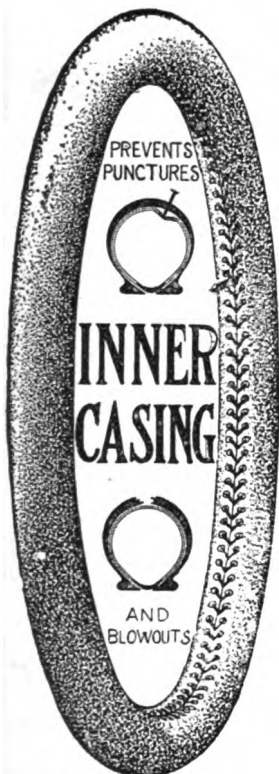
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A postal card will bring our book—
"Money Saving Facts about Tire Repairs."



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Is very clearly and fully explained in our little booklet

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If you own an automobile, you cannot afford to be without it, as it will help you to

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Especially for

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THE ONLY NICKEL POLISH MADE

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REX LEATHER DRESSING, REX WOOD OIL and REX METAL CREAM POLISH

The same to-day, yesterday and always—REX

Always REX, the same dependable REX

Eternally REX, the same REX

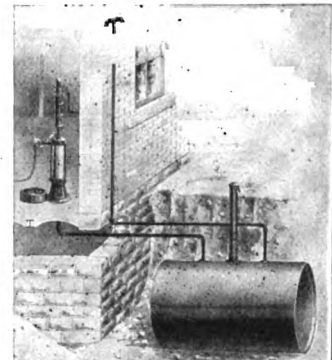
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Is a black sheet packing.

It withstands the action of oils or water, either hot or cold.

It does not deteriorate with age.

It has exceptional tensile strength.

Is effectual in a very thin sheet.

Is light in weight, but tough as rawhide.

Is excellent for motors, gear and transmission case gaskets, etc.

Sold through agents or direct.

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At a Big Saving

Broken cylinders, crank cases, etc. (both aluminum and cast iron), welded and made as good as new.

No delays—we return part within 24 hours after it reaches our shops. Our charge is but a fraction of the cost of a new part.

Hundreds of car owners send us parts. Their letters are the strongest proof that we are leaders in this work. You risk nothing—our guarantee protects you.

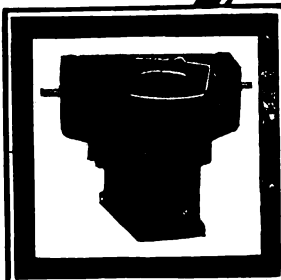
Illustration shows repair made for Consolidated Motor Co., Bridgeport, Conn. New cylinder costs \$45.00; our repair charge was \$15.20.

Write for full particulars of our service.

Guarantee of Protection

If, within one year from date of repair, part is found unsatisfactory, because of poor workmanship on our part, return it to us (by freight collect). Upon inspection we will refund your money, or, if you prefer, do the work over without extra charge.

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The Best for Brakes of all Sizes. Does not burn or glaze. Grips, holds, is durable and satisfactory, profitable and economical. Stands up under all conditions. The lining you need!

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HESS-BRIGHT Ball Bearings

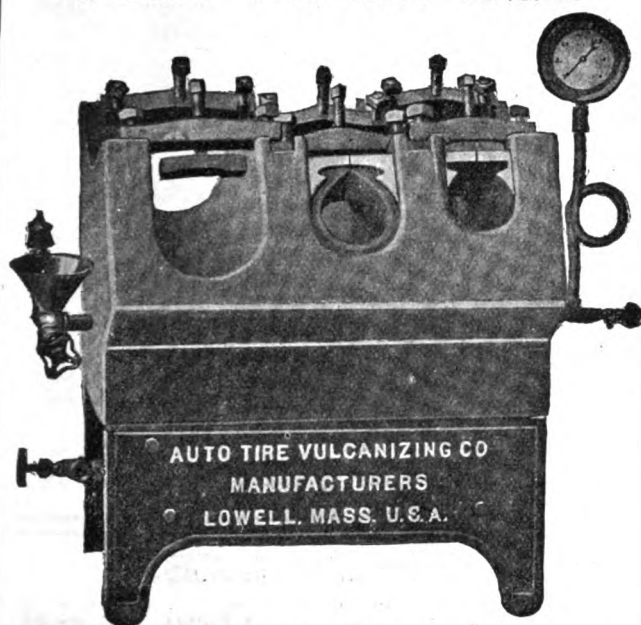
interchange with most other makes.

Write for the name of the nearest retail distributor.

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Our New No. 8 Adjustable Sectional Vulcanizer With Three Cavities



AUTO TIRE VULCANIZING CO
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As a Progressive Business Man you should by all means use, handle or recommend our

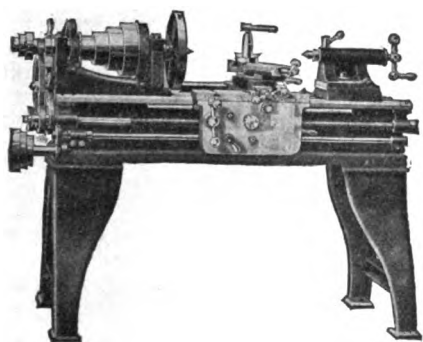
New Improved Auto-Tire VULCANIZING MACHINE

simply and solely because it is the best there is in Vulcanizers at any price and because the price isn't much, the operation is easy and profits are exceptionally large.

Our machine is different, far better and more economical in operation and investment cost than any other made. In all features it is so superior to all other devices there is hardly a comparison. We have some facts that will interest you and that will put you in the way of big profits. In your own interest, get posted—Write to us to-day.

Auto-Tire Vulcanizing Co., Lowell, Mass.

SEBASTIAN 15-INCH LATHE



The LOW-PRICE, PERFECT-QUALITY lathe for the GARAGE and GENERAL REPAIR SHOP.

If you are in the market for a lathe be sure and investigate the merits of the SEBASTIAN.

CATALOG mailed free on request

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ENCIRCLE

THE ENTIRE FIELD OF BRAZING



No. 1. For brazing brass, red copper and bronze.

No. 2. For brazing red copper and iron.

No. 3. For brazing iron and steel.

All ingredients in one piece, no waste, swelling or oxides.
Does quicker, cleaner, better work.

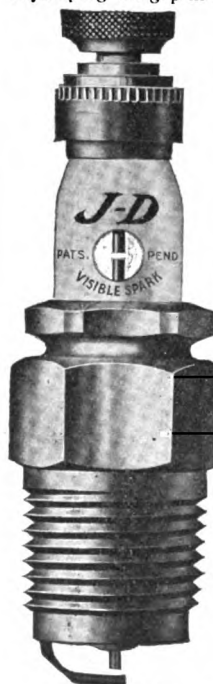
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Penna. Bldg., Phila., Pa.

Let this Spark Plug solve your ignition troubles

The new principle embodied in the J-D Visible Gap Spark Plug enables you to locate ignition trouble at a single glance. Through the port in the porcelain—*outside* the motor—you see if the spark is jumping the gap in the central electrode.



\$1.00

No more need to hunt and test and fuss. If the spark jumps but ignition fails, the plug is foul or carburetion faulty; if not, then trouble is in wiring, coil or batteries. Knurled adjusting nut allows you to widen or close gap. Opened, it intensifies spark and cleans spark point automatically. Uses minimum current, makes timing of engine easy, and permits regulating of spark in any cylinder.

One look tells everything

Will you test a set of these unique plugs at our risk? We will send you a set prepaid upon receipt of price (specify size wanted or make of car). Back of every plug we put our ironclad guarantee, "absolute satisfaction or your money back." Your word goes. We make millions of plugs a year—nothing else—of finest materials, even importing our clays and other ingredients for our porcelain that defies heat. Price of this plug—just \$1.00, same as any good plug.

Will you write us today? And ask us too for our FREE book on Ignition—a classic with motorists.

JEFFERY-DEWITT COMPANY

553 Butler Avenue,

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Leads them all, Saves 10 Times its Cost in Gasoline, gives more power, transforms every particle of gasoline into a fine mist and sends it in a whirling volume to combustion chambers; no moving parts, never wears out. Easily attached to any car. Write for prices to the trade, or send \$1.00 for sample, postpaid, giving model, H. P., and make of car.

We quote extracts from hundreds of unsolicited testimonials.

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"The Automizer received and immediately put to use; would not do without it; enclose check for two more. I believe they can be sold to every man that owns a car."—S. P. Wilson (Postmaster), Wood River, Neb.

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"Sold over 100 from our Garage. Benefit new as well as old cars."—Frank L. Cole.

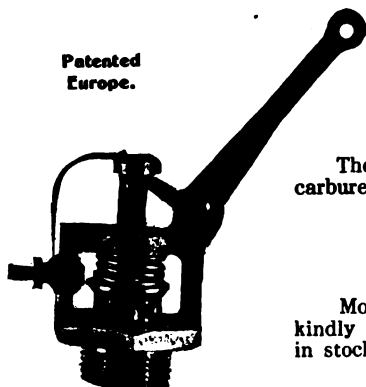
"One of our customers is using your Automizer. Before doing so he was getting 16 miles. The first time he measured he got 20 miles; on the second filling 23, third filling 22, etc."—Motor Supply Shop (Jobbers Auto Supplies), Columbus, Ohio.

Manufactured by

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FREE! FREE! FREE! Our IMPROVED M & M ECONOMIZER on Thirty Days' Trial IF REFERENCE IS FURNISHED.

Patented
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Showing Valve When Open

Can be attached to any car in a few minutes. It may be controlled by a friction foot pedal or hand lever.

Requires but a $\frac{3}{4}$ " pipe tap to insert into manifold.

Will save you from 40 to 50% of gasoline and 10% of the car expense.

Will give you 20% more SPEED and POWER with less gasoline.

The only known carburetor adjuster on the market. Do not throw your old carburetor away until you have applied our device. THEN NOTICE RESULTS.

**PRICE COMPLETE, Including Friction Pedal,
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Can be sent by mail for 17 cents extra for postage.

Money refunded in thirty days if unsatisfactory. When ordering by mail, kindly enclose check or money order. If your dealer does not have our device in stock, we will gladly sell direct.

*Send for Our Latest Catalogue, which contains
Valuable Information for Every Motorist.*

Patented
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PERFECTION SPRING WINDER



**WILL EARN ITS COST IN ONE
DAY'S USE.**

Adopted by leading manufacturers and machinists as standard for precision winding of extension, compression and torsion springs. Also adapted to wind taper, double taper and left-hand springs. Makes springs any length, diameter and pitch from any gauge wire. No wire wasted. Winds to last inch of stock.

TWO SIZES } Capacity of small size up to $\frac{3}{32}$ inch wire. Price \$1.00
Capacity of large size up to $\frac{3}{16}$ inch wire. Price 1.50
Special size up to $\frac{5}{16}$ inch wire. Price \$3.00

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No. 2.

Gardner Garage Pumps.

Within the reach of all. Don't say you can't afford a compressor until you get our prices and Special Proposition.

Our new catalog is ready for distribution. Send for a copy.

**THE GARDNER GOVERNOR CO.,
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TIRE PROTECTION GUARANTEED The "INNERSHU"

WRITE
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**COMPRESSED AIR
OUTFITS
LEAST WEAR AND CARE
G.S. Comstock, Mechanicsburg, Pa.**

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DO YOUR OWN VULCANIZING**Simple, Easy and Sure.****Our Vulcanizer Repair Kit. Price \$3.00**

Weighs 3 lbs. Gives you inner tube in 15 minutes.

Always ready to repair the inner tube.
Guaranteed to satisfy.*Write for particulars.***ELECTRIC CITY SPECIALTY CO.**

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J-M Non-Burn Brake Lining

Being made of pure Asbestos reinforced with strong brass wires, J-M Non-Burn will neither char, burn nor unravel. Oil, gasoline, water, etc., cannot impair its gripping power. Outlasts twelve ordinary linings.

It locks wheels almost instantly when emergency demands—gradually when desired.

Insist on J-M Non-Burn. The genuine bears name. Sold by most dealers.

Write nearest Branch for Sample and Booklet.

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Seamless Steel Tubing

Over 1,000,000 Feet on Hand.

SEND FOR OUR LIST.

1500 SIZES.

YOUR SIZE IS HERE.

ALSO COLD DRAWN SEAMLESS TOOL STEEL TUBING.

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118 N. Seventh Street
Philadelphia, Pa.**AIR ALWAYS ON TAP**
ALL YOU WANT—AT RIGHT PRESSURE—NO WAITING
CURTIS COMMON SENSE GARAGE PUMP

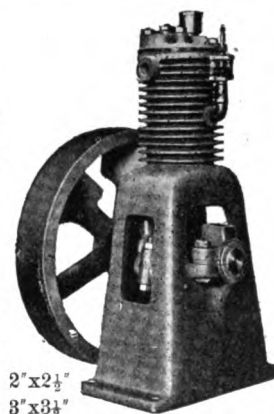
WILL LAST A LIFE TIME

For Stationary or Portable Service—Belted Direct to Motor or Line Shaft—Will Furnish All the Air Ordinarily Required About a Garage—or Air for Your Sprinkler and Water Supply Systems.

CONSTRUCTION DETAILS

Vertical up-plunger type—will not carry oil over into the tires. Fewest possible number of parts, hence less friction, less power required, less oil and fewer adjustments. Fan shaped fly-wheel arms direct a cyclone of air on cylinder radiation flanges. Springless intake valve in the piston head that insures prompt valve action.

WRITE US TO-DAY FOR PARTICULARS AND PRICES.

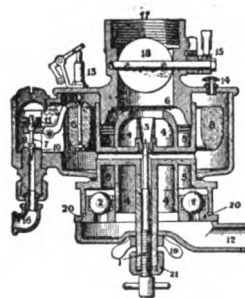
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Send your wheels that need repairing to

PHINEAS JONES & CO.,Phones 1571 } Market.
1573 }**NEWARK, N. J.**

Or to Branch Factory, 12th Ave. and 55th Street,

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NEW YORK CITY.**Full Equipment of the Latest and Best Machinery.****PLANHARD CARBURETORS**

are not only different but give greater motor efficiency than any other on the market. The Planhard is the only auxiliary air ball control in the world.

Write for trial sample.

Live agents wanted.

THE PLANHARD MFG. CO.

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FREE TRIAL AT OUR EXPENSE

FOR 2 MONTHS

Isn't This a Fair Offer?

We do this because we want you to be thoroughly convinced of the superiority of

SHARP SPARK PLUGS

All you have to do is to fill out the coupon below and mail to us.

To introduce Sharp Spark Plugs to you and to convince you that their unusual construction makes them unusually effective, we want you try them out in your car for two months *at our expense*. There are only two conditions to this offer—first, the accompanying information blank must be carefully filled out; second, at the end of two months you agree either to forward the purchase price of the plugs or return them to us.

In this way there is no risk or expense to you, if you are not perfectly satisfied with Sharp Spark Plugs.

Better send in your coupon at once as the demand is increasing every day.



The Sharp Spark Plug Co.

3378 Broadview Road, CLEVELAND, OHIO

In return for replying to the questions below please send me.....Sharp Spark Plugs { Mica Insulation, each \$1.25 } for two months' trial. At the end of two months I agree to return the plugs or forward the purchase price of \$.....

Name of Car.....

Year of Model.....

Size of Plug.....

State License Number.....

No. of Cylinders.....

Plug now used.....

My dealer's name is.....

My name is.....

Address.....

Town.....

State.....



THE PLUGS THAT PUT "ARK" IN SPARK

They produce an ARC flame



End view showing arrangement of electrodes and condenser terminal.

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THE BEST IGNITION EQUIPMENT CO.

200 West 64th Street, New York.

IRVIN SILVERBERG & CO.,

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Don't Throw Away Your Worn-Out Annular Ball Bearings

Have them REGROUND and made as good as new.



We regrind all kinds of Annular Bearings. Also carry a complete stock of S. R. B. Annular, Thrust and New Departure Double Row and Radax Bearings. We have a large stock of reground bearings on hand for immediate exchange, both at Chicago and New York. We can fit you up no matter what your bearing troubles are. All sizes high grade steel balls in stock.

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NEW YORK, N. Y.

2632 Michigan Avenue,
CHICAGO, ILL.

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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING.

VOL. XIV, No. 3.

NEW YORK, NOVEMBER, 1912.

PRICE } 10c. PER COPY
\$1.00 PER YEAR

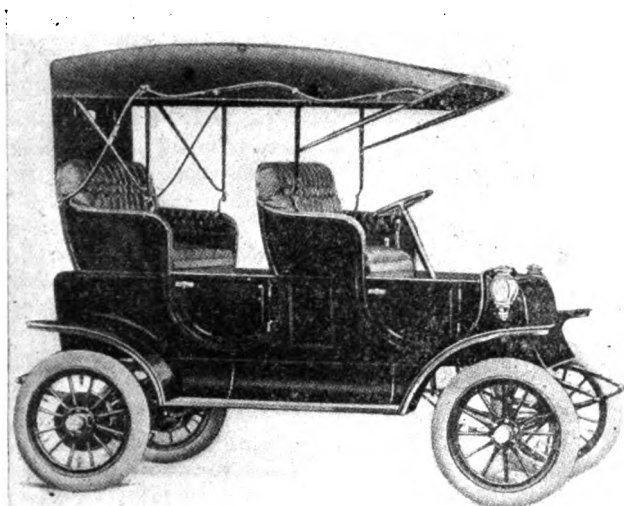
ELECTRICAL VEHICLES CONTINUED.

How Easily the Reversing Is Done and the Field Magnets.

No. 4.

BY SYDNEY F. WALKER.

One of the great beauties of the electric drive is the ease with which reversal is accomplished. With the gasoline drive, it will be remembered, the clutch has to be thrown out, the gear wheels thrown out, their arrangement changed, often with the chance of chipping them, and thrown in again. It requires a considerable amount of care and skill to accomplish this satisfactorily, with the minimum amount of damage to the wheels. It speaks volumes for the care with which modern gear wheels are turned out, and for the care



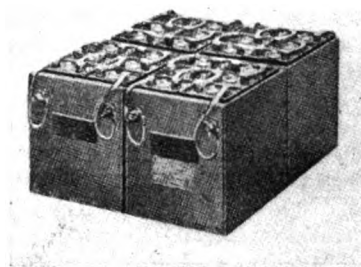
Waverly Electric Stanhope.

with which a number of drivers are able to operate the gear, that the gear wheels wear as long as they do.

With the electric drive, reversal is accomplished by changing the connections between the battery and the motor. The matter will perhaps be better understood if the field magnets and armature of the motor be looked upon as two or four electro magnets. One important property of both permanent and electro magnets is the attraction which takes place between poles of opposite name, and the repulsion between poles of the same name. Thus, if two freely suspended magnetic needles are placed near each other, the North pole of one and the South pole of the other will be found to approach, as far as they are able; and if it is possible, the two magnets will arrange themselves in parallel lines; one North and South pole at one end of the rectangle formed by the two needles, and the other North and South pole at the other end of the rectangle.

In the electric motor with only one set of field mag-

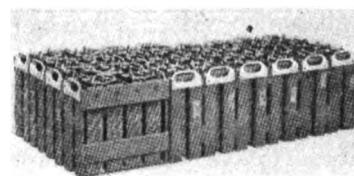
nets, one of the poles may be looked upon as a North pole, and the other as a South pole. That is to say, if a freely suspended needle magnet were brought into the neighborhood of the two poles, the South pole of the needle would be attracted to one of the poles of the field magnet, and the North pole to the other. When



Lead Storage Battery.

a current passes through the armature of a single field electric motor, it divides between the two halves of the armature in such a manner that one half of the armature core and of the wires in which the current is passing, form a North pole, and the other half a South pole. The portions of the armature, which are North and South poles, are continually changing, as the armature revolves and as the current is directed through the coils. As each segment of the commutator passes under the brush the direction of the current in one of the coils attached to that segment, is reversed; and this is continually going on, as the armature revolves so that one-half of the armature may always be looked upon as a North pole, or as some engineers prefer to put it, as a North seeking pole, and the other half as a South or South seeking pole.

In the electric motor with two or more field magnets, as mentioned above, the field magnet poles are alternately North, South, North, South; and the armature



Edison Storage Battery.

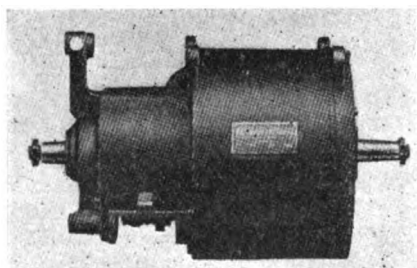
is divided into four sections, representing also alternately North and South poles. When the motor is working, the current is so directed through the coils, and the polarity of the sections of the armature is such, that each section tends to move toward a field magnet pole of the opposite name to itself, and to move away from a field magnet pole of the same name as itself. The portion of the armature approaching a field magnet North pole will be a South pole, and the portion approaching a field magnet South pole will be a North pole; and this arrangement is continually re-

produced by the action of the commutator, as the armature revolves.

It will be evident that reversal of the direction of motion of the armature can be produced by making that section of the armature which was a South pole, and which tended to move towards a North pole, carrying the armature say in a clockwise direction, into a North pole, and giving it therefore the tendency to move towards the South pole, or in a counter clockwise direction.

One caution must be given here. In the series wound motor, it is not sufficient simply to reverse the connections of the cables leading from the accumulator to the motor. In ordinary working, a lead connects the positive pole of the accumulator, through the controller, to the positive terminal of the motor; and another lead connects the negative pole of the accumulator, through the controller, to the negative terminal of the motor. It is not sufficient to cause reversal of the direction of motion of the armature, to connect the wire from the negative terminal of the accumulator to the positive terminal of the motor; and the positive wire from the accumulator to the negative terminal of the motor.

As the armature coils and field magnet coils are connected in series; merely reversing the connections at



The Multipolar Motor of the Waverly Electric.

the terminals of the motor, will reverse the direction of the current through both armature and field magnets, but will not reverse the relative polarity of the field magnets and the armatures, and will not reverse the attractions and repulsions.

The field magnet pole which was a North, will now be a South, and that which was South will now be North; but the South pole of the field magnet that was approached by a North pole on the armature, and is now a North pole, will be approached by a South pole, and the North pole of the field magnet and is now a South pole, and which was approached by a South pole of the armature will not be approached by a North pole; so that the direction of revolution will remain the same.

What is required is, reversal of the directness of the current in one. This may be accomplished by reversing the direction of the current passing round the field magnets, keeping that going round the armature in the same direction as before; or keeping the current in the field magnets in the same direction, and reversing the current in the armature. It is a matter of convenience, and as will be seen, is carried out at the controller, or by a reversing switch. Figs. 7 and 8 in the October issue, show the connections when the controller is used to reverse, Fig. 9 when a reversing switch is employed. For varying speeds in the reverse direction, the same arrangement holds as with forward movement. If varying speeds are obtained by altering the connections of the battery for forward speeds, and by the insertion of resistance, the same arrangement

holds for the reversal. If varying speeds are obtained by varying the connections of the field magnets, and inserting resistance, or shunting the field magnet coils, the same arrangement again is carried out.

THE REED HORN.

Why It Gets Out of Order and How It Should Be Handled.

BY JAMES F. HOBART, M. E.

Like some other automobile accessories, the horn can scarcely be said to be a "Thing of delight and a joy forever," for at times, there are few things which can be more exasperating.

It is quite possible to have a pleasing toned horn and with a little care, the tone may be kept so all the time. Evidently the great trouble with automobile horns, and the reason why they get out of order, is that they do not receive proper care. Not only does the owner or operator neglect the horn and let it go without attention but not one good driver out of fifty-nine will be found to know how to fix a horn when it is "out of whack," or even how to care for one so as to keep it in good condition. It is high time that some attention was given to the horn.

The ordinary horn reed consists of a brass tongue which is set into rapid vibratory motion by means of a slight air current from a rubber bulb. The vibrations of the brass tongue are imparted to the metal trumpet to which the reed is attached, and the combined vibrations of the air and the brass trumpet, are delivered in an amplified condition, to the atmosphere.

When a horn fails to work properly, the first thing of course, is to find out what the trouble is, and where it is. First, unscrew the coiled wire connecting tube and pull out the reed-shell, which may present an appearance similar to either A, B or C Fig. 1, or D, Fig. 2. The first thing to look for, is dirt. A collection of foreign matter between A, B, or C, D, will put the reed and the horn out of business completely, provided the dirt gets into the right place. Dirty reeds are to be found, giving perfect service, but they are liable at any minute to go bad, for a small speck of dirt may put the reed out of business at any time.

In the old-fashioned—now seldom seen—form of reed shown at A, the reed vibrates through a slot, between the edges of a plate of much heavier metal than that in the tongue or vibrating portion of the reed. A bit of dirt may become wedged at E, between tongue and frame, without stopping the reed action, but shows its presence by a sudden increase in the pitch of the tone delivered by the horn. The pitch of the tone delivered, depends upon the number of vibrations made per second, by the reed tongue, and this is decided by the length, width and depth of the tongue, also to a certain extent by the size and shape of the horn to which the reed may be attached.

For instance: Blow into the reed with the mouth and the tone given out is sharper than the tone delivered by the same reed when attached to the horn. The effect of the dust particle, at E, may be such as to wedge the tongue a, fast at point d, thereby permitting a lesser length of tongue to vibrate. This will make the tone of the horn higher than it was, therefore, any sudden increase in pitch of the tone given by a horn, may indicate the presence of dirt, which should at once be sought for and removed.

In case the dirt wedges the tip of the tongue, at A, then the horn is out of business completely. Sometimes a bit of sand gets caught between the end of

tongue and frame B, at the extreme of the vibrating distance traveled by A. This fact may often be known by the feeling of leakage, when the bulb is pressed. The reed being held away from the frame, air leaks through the opening and gives the peculiar feeling to the bulb referred to above.

A few sharp, sudden strokes upon the bulb possibly may loosen and dislodge the bit of sand, but it is better to remove the reed and examine it very carefully to detect any dirt which may have become lodged there. But, clean carefully and don't monkey with the reed until everything else has been found in proper condition. Reeds are easy things to adjust when you know how, but they are as bad as carburetors to get "all balled up" when you don't know the first prin-

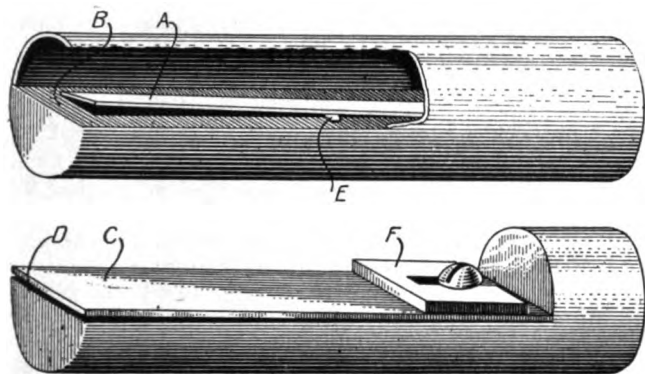


Fig. 1.—Frog Reeds.

ciples of reed adjustment; therefore, go slow, and look to everything else before touching the reed, except to clean it thoroughly—and very carefully.

When there seems to be a leakage of air through the reed, test carefully to see if the bulb leaks or the reed is open. The bulb may be tested by unscrewing the wire connecting tube at the horn, then, close the end of the tube with a finger and press the bulb. If there is leakage, the bulb will collapse under the pressure exerted, but if the bulb is tight, there will be no flattening of it to any considerable extent, and the trouble must be looked for somewhere else.

Having cleaned the reed thoroughly, and it still fails to work, look to the tongue to see if it vibrates through the hole in the frame without touching the frame at any time. Reeds sometimes bend sidewise (edgewise) under long continued use and such bending causes the reed to strike the frame hard enough to stop its action completely.

In a case like this, don't do anything to the reed. Do not try to straighten it or bend it in any way; just take the point of a knife or some other suitable tool and scrape away a little metal from the inner edge of the frame until the tongue can vibrate freely without touching the frame again. If the tongue lies low in the frame so you cannot scrape without touching the tongue with the knife, then raise the tongue very slightly by sliding a brass pin under it. Be very careful not to raise the tongue enough to give it a permanent set. That will put it out of business for fair.

Having fixed the frame so the tongue can vibrate freely without touching it there is nothing more that can be done to make the reed work, except to the tongue itself. And any adjustment to that member is a very delicate operation and will probably end by spoiling the reed completely. Still, a man can never learn to adjust horn reeds unless he makes a beginning and if you decide to offer up that particular reed as a

sacrifice, then go ahead, but procure another good reed before touching the old one!

The first adjustment to be looked after—the reed vibrating freely when pushed, without touching the frame—is the position of the tongue, above or below the top of frame B, Fig. 1. The reed is shown at A, in its proper position just a little above frame B. If there is too great an opening between the reed and the frame, it is evident that the reed needs bending downward a very little to bring the reed close enough to the frame to permit its being carried down by the current of air from the bulb.

To bend a reed, place a thin wire, or the point of a narrow knife blade, under the reed-tongue at the place where the bend is required to be made, then press the reed down with the fingers, very gently at first, watching to see when the bending is sufficient. The reed will bend far past its proper position when thus pressed, and the pressure must be carried far enough, each time going a little farther, to obtain the required amount of bend in the reed. But—don't bend the reed any more than is actually necessary. Never bend it too far and have to bend it backward again, to undo careless work.

The bending of the reed is to give it such a position that it will be caught by the bulb air, and forced backward until the stiffness of the metal sends the reed forward again in spite of the air pressure which again sends the reed to repeat the described vibrating operation indefinitely. A good deal of careful and intelligent experimenting is necessary to enable a man to bend a horn reed just right, the first, or even the second or third times he tries it.

But the form of reed, or the form of mounting shown by Fig. 1, is seen very seldom now-a-days in automobile horns, although this form gives the softest, most harmonious and pleasing tone of any of the reed

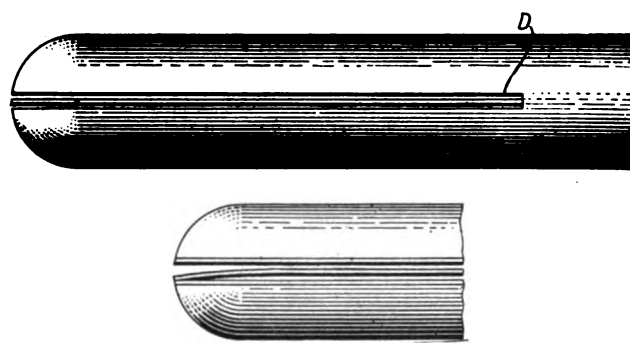


Fig. 2.—Double Reed.

horns. But its tenderness and the very fact that its tone is soft, has probably prevented its general adoption.

The lower form of reed shown at Fig. 1, is one which also is seldom seen, but which is a very desirable form, inasmuch as it may be adjusted by means of a screw, instead of bending the tongue when such adjustment is necessary. The tongue C is held by block F, against frame D, but in such position that the bulb air-current can force the tongue against D, before the force of the air is overcome by the stiffness of tongue C.

In this form of reed, the tongue is easily removed for cleaning and adjustment, it only being necessary to take out a single screw to remove block F, and reed C, which may then be cleaned and bended or twisted if found necessary. The stiffness of the reed may also be adjusted at F, to fit the reed for the size

and strength of the bulb in use. A small weak bulb needs a softer reed-tongue than a large bulb which gives a heavy blast of air.

But Type B, Fig. 1, is seldom seen any more and the frog reeds are nearly all of the type shown at Fig. 2. This form of reed is well known, it is double—not the reed, but the frame against which the reed strikes when the bulb is pressed. The reed gives a tone both ways, when going up, and when coming down, same as the single reed shown at Fig. 1, but the tone delivered by this cannot be compared with the tone delivered by A, in any manner, except for quantity and harshness. It certainly is ear-splitting when driven by a muscular hand upon a fully developed bulb of large dimensions. This reed does not make any more noise than the single one shown at Fig. 1, but reed C makes twice as much noise in the same time as it gives two vibrations to reed A's one.

The repair and adjustment of this form of reed is a matter which is hardly ever satisfactory to the one

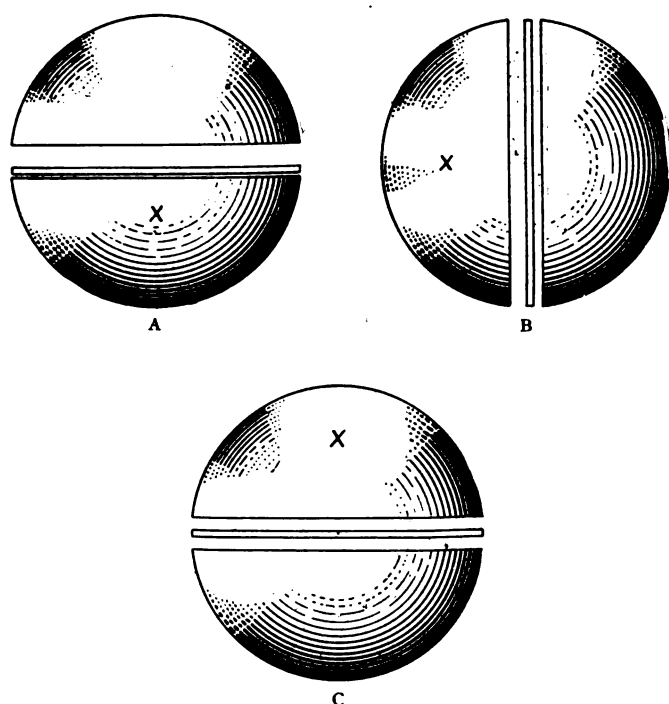


Fig. 3.—Effect of Reed Position.

who attempts it. It is almost impossible to do anything to this form of reed without removing the tongue, which may be unsoldered or driven out of its place accordingly as it is fastened, but this is apt to prove a sorry and unsatisfactory job when attempted outside the factory where reeds are made.

Having gotten the reeds so they will give a tone, see that the reed is attached to a bulb suitable for the reed. It is of little use to attach one of the double reeds to a small weak bulb, for these reeds require a lot of air under considerable force to make them work satisfactorily. Also, do not attach reeds as shown by Fig. 1, to a large strong bulb, for too much air, or air under too much pressure will flatten these reeds right down for the time being, and all the noise you can get out of them is a single "grunt" when the bulb is first pressed. Small weak bulbs are required for the soft-toned reeds.

When the horn fails to give a smooth, sustained tone when the bulb is pressed, then take off the wire

tube and work out for dirt, and look for the other things described above. If the horn still fails to tune up, then examine the reed to see if it has become flattened against one or the other of the frames. Sometimes this happens, and the horn will give only one or two little "grunts" when the bulb is pressed. This calls for the readjusting or bending, also described briefly in the preceding paragraphs. If the reed still fails to work properly, see if it is firmly fixed in the horn. When the opening thereto becomes worn a little, the reed is apt to lie loosely therein and the quality and volume of tone is often greatly lessened.

The reed should always fit so snugly into the horn that considerable force is necessary to put the reed into place, and a twisting movement is necessary, both in inserting and in removing a reed. It is often found that the reed being too small, a piece of paper has been inserted between reed and horn. This is very poor practice, for the quality of tone and sureness of action is often greatly lessened thereby. In some cases, reeds may be found with a strip of cloth wound around them to make a fit between reed and horn opening. Never tolerate anything of this kind. Either run some solder into the hole in the horn and then ream it out to the proper size, or, run some solder around that portion of the reed which goes into the horn, and then file down the solder until the reed fits the horn snugly. This often stops a bad rattle in the horn.

A good frog reed, fitted with a suitable bulb, horn and tube, and properly connected therewith, should work well in any position in which the reed may be placed, but when the reed is "touchy" then position may have a good deal to do with the tone obtained from the reed, also with sureness of reed action.

The writer has found that in some instance, where a reed would give two little short "grunts" and then flatten right down upon one frame or the other, that turning the reed around a little, often cured the trouble entirely.

For instance, as shown by Fig. 3, the work of a reed may be affected by its position, and the reed may work better with one particular part uppermost. In Fig. 3, at A, a reed is shown, looking fair at the end of the reed, where the tongue has become bent downward, either through fatigue of the metal, or through some amateur "adjustment." In either case, the reed fails to start when the bulb is pressed, only one or two short "grunts" being forthcoming. This is particularly the case when the reed is "soft" and the bulb is pressed very hard. A light bulb pressure at first, is often necessary to start a soft reed to sounding, but once in action, the bulb pressure may be increased to the limit without stopping the reed from working.

In Fig. 3, at A, the reed is shown close to the lower frame, and when air pressure comes, it simply flattens the tongue against the lower frame and holds it there. Turning the reed to a vertical position as shown at B, frequently helps matters very much, and sometimes, revolving the reed a half turn, to the position shown by C, will work a complete cure, bringing the tongue of the reed near enough to a central position, as shown, that it will start to vibrate immediately the bulb is pressed.

The above kinks may help out with troublesome reeds, but never be without an extra reed or two in the repair kit, for a bad accident can happen just because the horn wouldn't toot at a critical instant, and when frog reeds need nursing, as above—and they very frequently do, then one should never trust himself with a single reed and no reserve supply.

Tire Protectors From Old Tires.

From Frederick E. Small, Massachusetts.—Some time ago it occurred to the writer that old tires might profitably be used as protectors to prolong the life of other tires not yet discarded.

The author has had in service a good part of the present season an old tire 32x3½ with another tire 32x3½ pulled on over it and acting as an efficient protector, both to the old tire and the owner's pocketbook. The old tire to be used as a cover should be fairly good in the tread, that is, no holes through it for sand or dirt to work in between the two tires and chafe, but it may of had rim blowouts or been rim-cut, which practically ruins the tire. Such a tire is ideal for a

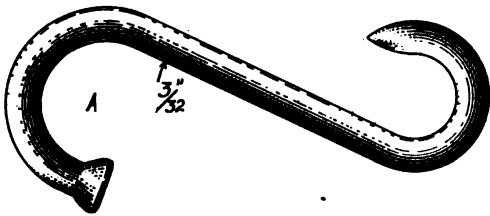


Fig. 1.

protector. The first move is to cut off the bead on both sides, using a very sharp knife wet with water, cutting as close to the bead as possible. Now with a belt or harness punch make holes 3-16 inch diameter ¼ inch from the edge (see cut of wheel) the same number of holes as there are spokes in the wheel. Next dampen the entire inside with water. Now dust in liberally fine flake graphite over the whole inside, rubbing it into the fabric thoroughly. This is very important. Set aside to dry.

The old tire to be protected may be in almost any condition so long as the beads are good. Before removing it from the rim, mark with chalk close to the bead, the location of each spoke. If it has blowouts or weak spots, apply a good reliner or inner shoe, so-called. If it has sand blisters dig them out, and clean

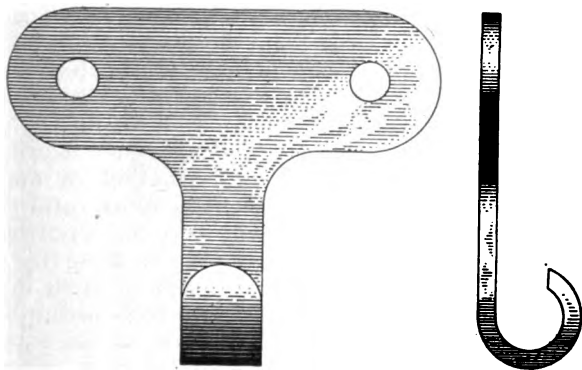


Fig. 2.

out dirt from any small cuts. Have some help to get the protector over the old tire, which must be off the rim. After pulling it on in one place tie it there; with patience and care the protector can be worked on over the old tire. It will not distort the inner tire enough to be noticeable. Now note where the chalk marks come on the inner tire and pull the protector around so that the holes which have been punched come midway between these chalk marks. Put the tire on the rim as usual, and blow up just enough to round it out. The protector can now be moved from side to side to make it true or equi-distant from the rims and central on

the inside tire. Next blow it up hard. It will fit like a glove and be as smooth and true as if it were made a part of the tire. Make some hooks as shown in Fig. 1. The writer used steel wire finishing nails 2 inches long by 3-32 inch diameter, bending them with round nosed pliers. The size and length of the bend A in Fig. 1, which should be made on the head end of the nail, should just allow that end of the hook to come through the holes punched in the sides of the protector. Insert a hook in each hole from the outside. Procure some ½ inch rawhide belt lacing (mineral tanned if possible as it is more pliable). Cut this so as to make two ¼ inch lacings. One quarter inch lacings can be bought but they are much lighter. Tie two lacings together and knot around a spoke, leaving two ends of equal length to lace with.

Lace as shown in cut from one side to the other, catching the lacing onto the hooks and tying to each spoke where crossing. Pull the lacing fairly tight, but not enough to distend the holes much. The United Shoe Machinery Co. make an eyelet



How the Casing Was Fastened.

which could be used in these holes if they could be obtained. If one were so disposed, sheet metal clips could be fashioned and riveted to the edge of this protector instead of hooks. This would make a much better fastening. See Fig. 2. However, the writer has experienced no trouble with the hooks tearing the fabric around the holes. It will be found that this lacing draws the sides of the protector tight against the inside tire, thus keeping out dirt and water and also preventing the protector from rolling and crawling. The tire is now ready for the road.

Pull out the sides of the protector occasionally and dust a little graphite between the protector and tire and you will find your otherwise discarded tires giving you many more miles of active service.

While the ordinary amateur will be well advised to send his car to the finishers to have any deep scratches treated, still if one feels that he is a super-fine workman, the best method of curing a "gouge" is to run beeswax and resin, melted together in equal parts, into the abrasion. When the filling has set, smooth off with fine sand paper and repaint.

No test of air pressure in a tire is of any value as a guide except a reliable gauge.

THE CREDIT BUSINESS.

Why Its Pays Repair Men to Co-operate to Avoid Bad Bills.

From G. D. Crain, Jr., Kentucky.—One day last summer a well-known broker in a large city of the Ohio Valley drove his car into the garage of a leading automobile dealer and repairer. He turned it over to one of the washers, went into the office and saw the dealer, and arranged to have a lot of repair work done on his machine, which had reached home in a more or less battered condition after a long tour of several thousand miles over roads which ranged from bad to worse and from worse to none at all.

The owner of the car had a rating in Dun's and Bradstreet's that was high class in every respect; and when inspection of the automobile showed that the amount involved would reach several hundred dollars, the dealer accepted charge of the job without a qualm. The work was done, the charges accumulating until something over \$500 was recorded and the car was turned over to its owner as good as new.

"Send the bill to the office the first of the month," he remarked as he drove away.

That happened a good many months ago. The bill isn't paid yet. The best that has been gotten is two notes, for \$250 each, that the broker signed without objection. They were put through the bank, matured and went to protest. Now the dealer is getting ready to sue, but having learned since that the firm of which the car owner is the head is in a shaky financial condition he hasn't much hope of getting out with a whole financial skin.

"Say, didn't you know that So-and-So was a bad credit risk?" inquired a friend and competitor of the repair man interested in the account. "I could have told you that long before this. He stung me for several repair bills, and I have an account on my books against him for a set of tires that have never been paid for, and never will be, I guess. I might attach his car, as you could also, but you know what every automobilist in town would say then. So I guess we'll have to grin and bear it."

"Why in the name of all that's sensible," ejaculated the holder of the worthless notes, "didn't you put me wise to him? His rating is gilt-edged, and I thought he was the best possible risk. If I had known what had happened to you, it would have been a c.o.d. job from start to finish."

"Didn't think about it," was the reply. "I didn't even know you were working on his car, and you didn't ask for information, so I had no opportunity to help you."

That is where the matter stands right now. But it has a moral that is worth pointing, and indicates that co-operation among the repair men of every community is not only a desirable thing, but is a necessity when it comes to such matters as credits.

Most of the business of the country is done on a credit basis, and that is equally true of the automobile repair man. Though he sells mechanical service, and does not regard himself as a merchant, his mercantile operations are such that his credit department, if he had one, would have plenty to do. In the absence of definite organization along that line, repair men are losing money right along, and have no way of preventing additional losses from accumulating.

As a suggestion for eliminating this kind of thing, the plan of a group of retail merchants in a large Western city may be cited. These merchants deal in a commodity that is universally used, and consequent-

ly keeping tab on credits is a comparatively difficult matter, contrasted with the situation where only a small class, such as car owners, is concerned. A central office is maintained, which is that of the secretary, and here every buyer of goods whose rating is not satisfactory is listed in a card index. Every member of the organization reports all of his bad accounts. He gives the principal facts regarding them, so that if the bad credit risk attempts to do business on that basis with another member, inquiry by the latter of the central office discloses his history, and further information can be secured from the firm which originally furnished the information. In this way, as experience has proved, it is practically impossible for continuous operations to be maintained either by the confirmed deadbeat or by the man who is a victim of circumstances and doesn't mean to cheat, but simply can't manage to pay his bills.

In most cities repair men and garage owners have learned the advantages of association work. In the first place, such matters as the employment of mechanics can be regulated so that the proprietor of a shop is not likely to pick up a man without knowing something about his previous record. Concerted action in connection with legislation is often desirable, especially when unreasonable regulations for fire protection purposes are proposed. In most cases united action results in reasonable provisions, instead of radical and burdensome ones, being adopted. And when prices on gasoline and other supplies are advanced to the dealer, the increase in quotations to the consumer can be posted at the same time by everybody in the association, so that there will be no assertions by owners that overcharges are being made by any dealer.

But while all of this good work is going on it is seldom that the credit proposition is taken up. Yet, considered correctly, it is more important than any of the things which have been mentioned. Those matters may result in inconvenience or petty losses, but one bad account is often sufficient to wipe out the margin of profit on scores of jobs. Just as in the case cited at the beginning of this article, a little timely information would have saved \$500.

Inasmuch as lists of car owners can easily be secured, it would be an excellent idea to have a record of each owner kept by an officer of the dealers' association. Any complaints as to credits could be filed there, and bad accounts could quickly be noted. No dealer would be so unwise as to undertake work for a new customer without learning whether or not he was listed unfavorably at the central office, and even if this was the case he would still have an opportunity to pass further upon the situation by getting the details regarding the previous experiences of those in the business, and thus putting himself in possession of all the facts, which might possibly justify him in extending credit.

General credit information is seldom exact. The man who pays his rent and his grocery bills promptly may have an idea that a repair man is a get-rich-quick individual, and that failure to pay him will not affect anybody seriously. Hence specialized information showing the credit history of every owner in several hundred per cent. is more valuable than ordinary information on this subject, and can be secured only by the co-operation of those who are in a position to furnish the facts.

There is nothing in the proposition to balk at, for credit reports are now a feature of every business, and no business man who furnishes records taken from his books as to his dealing with a customer has done any-

thing for which he may be held liable. It's common sense, good policy and sound business to protect one's self from credit losses, and this is the way to do it.

PAINTING THE CHASSIS.

It Is Quite Important as a Matter of Protection and A Question of Harmony.

From M. C. Hillick, Pennsylvania.—No small space has been occupied in the columns of various trade papers relative to the upkeep and appearance of the car, but somehow for the most part the subject of maintaining the chassis seems to have been quite overlooked. A fine appearing car body and a slovenly looking chassis harmonize no better than a man clothed in fine raiment and wearing mud bespattered boots. Harmony, after all, is one of the things that strongly help in the makeup and outfitting of the car, and without this virtue a great many features about the car would be at sixes and sevens.

The chassis many times are given a light going over with some sort of a dressing or varnish reviver, and let go at that, while the body of the car gets a fresh coat of varnish, and everything above the chassis is touched up and made to look like new. This, to say the least, is hardly fair treatment for a part of the car that is made to suffer from the worst possible sort of road and weather service. In washing the car the chassis invariably gets the worst of the bargain. Grease and dirt baked and dried on to a condition almost non-removable fetch these parts during the cleaning process down to a point where but very little, if any, protection is afforded them. Especially is this the case when it becomes necessary to use strong detergents to start the grease and dirt accumulations. Alkalies of various kinds are used, even to the application of sal-soda, caustic soda, etc., all of which lay hold upon the finish with a biting tongue, with the result, as above stated, that a new creation of color must be put on. And, really, this is the cheaper way of bringing the chassis to a condition comparable to that of the body when extreme conditions necessitate the use of the powerful acting detergents.

It is not unlikely, in many cases, that by applying at frequent intervals some good, reliable renovator, or reviving medium, the finish on the chassis or running parts could be maintained in nicer condition, and for a very much longer period of service, than is too often the case under the present arrangement.

When the car is brought to the shop for repainting and finishing, the chassis should have at the outset special inspection in order that these parts of the car may be made to compare favorably with the body and the other parts above the chassis.

In the event of chipped and flaking parts of the surface of the chassis, all such defects should receive a "touch up" with a good lead paint containing some of the regular parts color. Then where necessary putty these defects, and in case the surface looks parched and worn and barely able to hold intact, apply a coat of lead paint containing for every five parts turpentine one part raw linseed oil. Let this pigment cure out and harden thoroughly, after which sandpaper with fine sandpaper, clean up, and apply a coat of the desired color. Should the chassis show even a worse condition than this, the parts will need two coats of the surfacing lead; the puttying in this case being done upon the first coat of lead paint.

Lay these coats of pigment on as smoothly as pos-

sible, in order to lessen to the minimum the labor of sandpapering and also to obviate the necessity of working the bulk of the pigment off as a means of getting the desired smoothness of surface.

Should parts of the chassis show a surface shattered and fractured, and quite upset in general reduce the consistency of some of the hard putty by cutting it down with turpentine, and then with a stiff piece of harness leather draw putty over these badly defective parts. The main consideration is to get a good, solid body of pigment in place, above which to bring out through the aid of the color, varnish color, and clean varnish coats, a full, rich finish, well rounded throughout, and fortified against the hard service sure to beset the chassis. Finally, as a means of contributing to the more excellent appearance of the car's running parts, use a high class line of colors and varnishes—quite as good in fact, as are used upon the body of the car.

GARAGE AND REPAIR SHOP.

Handling Parts and the Sale of Supplies to Owners Direct.

From G. D. Crain, Jr., Kentucky.—An interesting question as to the handling of material used in repair jobs and accounting for it is frequently discussed, and the wide variety of methods used by dealers suggests that not everybody is satisfied in his own mind as to the proper plan of handling a transaction of this kind. The system used by a leading dealer in one of the large cities of the Middle West may be of interest.

In addition to conducting a repair shop and garage, this dealer also has a store for the sale of tires, lamps and sundries, as well as bicycles and other allied lines. All of his repair parts are carried to the credit of the store. This is an important feature, since it results in prices on parts being figured on the basis of the overhead expense at the store, and not of the shop. The distinction is that the store overhead is certain to be greater than that for the shop, principally on account of the larger rental involved.

It should be mentioned here that this dealer, like other members of the trade who have studied the question and arrived at logical conclusions, is convinced that in determining the cost of doing business, the dealer should consider each department separately; for while they are all part of the same organization, the expenses of operation are different, and consequently the overhead expense varies. Since this is the most important element entering into the selling price of an article, or a job, not including the original cost or the labor expense, it is certain that putting it on the right basis is the first step in the direction of getting a price which will show a profit to the dealer and at the same time be reasonable from the standpoint of the consumer.

Thus, in the case under consideration, repair parts and all other material are part of the store's stock of merchandise, and are treated accordingly. When material is required by a workman, he transmits the information to the foreman, who sends a boy employed for this purpose to the store-room. A salesman delivers the goods to the boy, making out a sales-slip in duplicate. The original goes with the material, and is attached to the shop-card showing the labor and material used in each job. The copy goes to the bookkeeper, along with other sales records, and is used in figuring the cost to the consumer, in con-

nection with the hours of labor put in and other factors which determine the cost of the work.

There is a complete check on every item which is used, for the reason that the foreman's report of each job shows material consumed in it, and each piece of material must be accounted for by sales-slips. If there is a slip which has not its counterpart in the records of the shop proper, an error is disclosed which is looked into, with the result that it is usually learned that the material was used without being properly entered up in the shop. This goes to show that unless a system is provided in which there is a definite check on the use of material, it is easily possible for repair parts and other goods carried in stock to be used up in repair work without the necessary charges against the job being made.

There is no chance of material being sent to the shop without being shown on the sales-slip, for there are iron-bound rules providing that no material is to be issued except by a salesman. Even the foreman of the repair shop must get material in this way, and the owner of the shop has made it plain that infraction of the rule will be followed by dismissal. The result is that nothing leaves its place unless a proper record for the use of the office and for the guidance of the shop foreman is made.

This description may suggest that a lot of time is lost in getting material from the store into the shop. This, however, is not the case. The repair shop is on the second floor of the building, and stock used in repair work is carried on that floor as well as the lower part of the building. The boy who is used to bring material to the repair shop is given a list of the parts needed sufficiently in advance of use to enable him to have the material ready before it is actually needed. The application of the workman and the exact part or piece needed, so that when the sales-slip is made out, all of these facts are shown and the entry made accordingly.

A prime advantage of the system from the standpoint of the owner is that it results in eliminating the necessity of employing one man for stockroom purposes. In some shops, not particularly large ones, either, a stockroom man does nothing except issue material and parts on requisition, and make the proper records. The expense of this work is considerable, in the aggregate, and since the stockman is not a producing employe, his wages must be figured on the cost of every job that goes through the shop. On the other hand, according to the system outlined, any salesman can issue material or parts, and the cost of this work is nil, as far as the shop itself is concerned, for it is figured into the overhead expense of the store.

It is also to be noted in this connection that since repair parts and material used in shop work of all kinds are carried as to the credit of the merchandise account, and not as part of the investment in the shop, the latter is given a first-class opportunity to pay expenses. Its investment consists of tools and equipment only, and its chief expense is for labor and power. If it can't make ends meet on that basis, then obviously it is not likely to make money under any conditions.

On the other hand, the dealer who finds himself just breaking even on his shop operation—and many an automobile repair shop is doing a good deal worse than that—can console himself, if he is using the plan indicated above, with the reflection that he is making a dealer's profit on material used in repair work, even if he is not getting anything out of his expenditures

for equipment and labor. And that is a point worth thinking about.

The same considerations apply to the sale of parts and material to owners direct. In some cases motor car owners with a practical turn of mind, or those who are so located that repair shops are inaccessible, desire to purchase parts and do their own work. Some dealers discourage this, preferring to have an opportunity to add charges for labor and thus swell the receipts of the repair shop. This is a shortsighted policy, however, for a cleancut profit can always be made on a sale of goods, while the margin on a repair job is a doubtful quantity at best. Dealers who sell to the general public as well as to their own shops are convinced that they would be better off, as a matter of dollars and cents, if their business was handled entirely on this basis; but as a matter of practise, of course, service to customers, as well as other considerations, demands that the dealer be in a position to take care of repair work.

The plumbers used to think that there was no use giving out material unless a bill for labor accompanied it; but they have changed their policy since hardware stores and other merchants began selling items which were formerly regarded as the special perquisites of the plumber. Though the automobile repair man is not in danger of having his material field invaded by competitors, he too will find it good policy to sell all the merchandise he can, no matter whether he handles the actual repairs or not.

Care of Tires in Winter.

Many motorists in all parts of the country are now laying up their cars for the winter. Hundreds of these cars are equipped with good tires, which if properly taken care of during the cold months will be in serviceable condition next spring.

The percentage of tire waste during a winter's inactivity is very large, due in a majority of instances to the fact that owners do not know how to store their tires to protect them against the ravages of cold weather. To reduce this waste the service bureau of the United States Tire Company gives some timely advice on the subject.

In laying up a car the tires should be removed from the rims and washed thoroughly with soap and water. They should then be carefully wrapped in strips of paper or cloth and stored in a dark place which is kept as nearly as possible at a temperature of 50 degrees.

If the tires are to remain on the wheels for a considerable length of time while the car is out of service the wheels should be jacked up and only about five pounds of air left in each tire. This keeps the tubes in shape and also preserves their softness and pliability. When the wheels are not jacked up and the car is allowed to stand for any length of time the tires should be kept well inflated and the car moved occasionally, so that the tires do not flatten from standing too long on one spot.

For the man who takes care of his own car and intends to undertake the big job of repainting his machine, there is a little matter that merits attention. Before any paint is put on the car, cotton should be stuffed in all oil holes which serve to conduct lubricant to the spring shackles and adjacent parts.

In cold weather tires should be pumped up five pounds harder than in hot weather.

SKIDDING DANGERS.

A Racing Driver Gives His Views and the Result of His Experience.

A racing automobile driver says: "I wonder how many people who drive an automobile purely for pleasure realize that in driving a racing car around a turn at high speed it is the inside wheels that leave the ground instead of the ones on the outside, as you would naturally expect. At first thought this seems contrary to gravity and every other reason, but when you think it over you find that the greatest weight and pressure comes on the outside wheels, and it is this weight and pressure that makes them hold the traction, while the inside wheels refuse to do so.

"All kinds of devices, good, bad and indifferent, have been invented, promoted and used to increase the safety of driving under these particular conditions. Most of them have gone the way that most novelties do, because novelties as a rule do not serve a practical purpose; but inventive genius was persistent and from a vague idea of what was needed the non-skid chain was finally evolved, and it has done more to raise the safety and hence the pleasure of driving than any other one thing in the automobile world.

"I remember the time when tire chains were first brought to our notice as a skidding preventer. In fact every one in the trade here ridiculed the idea. However, the doubting tradesmen were invited to a comparative test. Two cars were taken, one a huge Panhard and the other a light Renault. The Panhard, which had a name at the time of being a veritable merry-go-round on wheels, was equipped with a set of chains on the rear wheels and the Renault was equipped with the then popular steel studded tires as an anti-skidding device.

"The Renault was started from Broadway toward Seventh avenue, New York, and just before it reached the avenue the brakes were applied and the car swerved smoothly and continued on for a distance of about twenty-five feet, while the Frenchman driving the car smiled and facetiously remarked that the old Panhard would have to 'go' to even equal his performance. The clumsy old Panhard was started on its way and the crowd at the corner backed off so that the car would have plenty of space to swing once it got started. At the instant that the brakes were set, to every one's surprise the heavy old car stopped within a few feet without any perceptible side swing. The onlookers were amazed and they surrounded the car, looked everything over, felt the chains and examined the tires.

"They were still unconvinced, and after a few minutes demanded another test. Again the old Panhard was started off, carrying as passengers this time three of the sceptics. At the corner the car was swung purposely for a skid, but it again refused. As the result of these few tests one prominent dealer ventured the expression that 'he would take a few sets and see how the darn things would take with his customers.' Suffice it to say that from that time on the chains sold themselves in that territory.

"I believe I might safely say that I have tried everything, but I have never been satisfied by anything else as I have been with chains. Of course, it helps to know how to handle a car when you have no chains on—that is when you are caught in a storm or when you suddenly strike a piece of pavement where the 'dust has been laid by the sprinkler.' It's always wise to drive slowly over any wet road, and yet it is not the speed of the car that makes it skid, but it's when you try to turn or stop that

the damage is likely to come. First of all, don't apply your brakes quickly. Quick application of the brakes makes the wheels slide, and the slide comes from two directions—forward and at the same time sideways. A gentle or gradual applying of the brakes will do much to eliminate the side slip, but the best thing to do at the moment the car starts to slide at the rear is to turn your steering wheel sharply in the same direction. This allows the rear wheel to roll again, and from this you can readily understand that as soon as the wheels begin to roll the control of your car has come back to you, and, of course, the longer the wheel base of the car the quicker it will come back on its line."

Novelties Observed On Automobile Bodies.

The man who observes and records all the new things worth looking at on automobiles now, is a busy fellow because the use of the car has become so general and sharp competition has forced the builder of bodies to hustle up a bit and put on all the good fea-

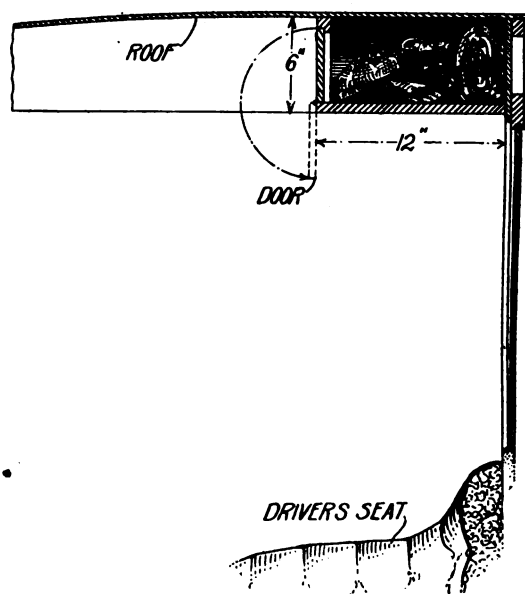


Fig. 1.

tures that his ingenuity can invent. The public is past the "lemon" buying stage and the special body must have some exceptional features or it will fall short in comparison with the stock article.

The adoption of the deep seat cushion has in turn crowded out the room for locker space under the seat, and Fig. 1 shows a method of utilizing the waste room under the roof for locker space for light articles. This locker is well back and does not interfere with the head room of the driver. The dimensions are given and the door, which is shown in the open and closed positions, is fastened with a cylinder lock, the key of which is the only handle used for the door. The illustration shown is on a limousine with a deep balloon roof, but the idea can be carried out on any body where the room above the driver is sufficient to permit of taking the space required.

Fig. 2 is another idea that will find general acceptance with the wise public. The feature of this figure is the front post, marked A-A. This is novel in that it substitutes a wood upright in place of the regulation iron standard to support the roof at the front and form a frame for the front windshield. A tight joint can be obtained around the front glass, something that

was never possible with an iron post, also it eliminates painted or plated iron work, but best of all it furnishes a substantial framework at the front that makes it an easy matter to convert a semi-enclosed body into a closed body without much expense to the owner, the door can be made to go all the way up to the roof and a glass added between the door and the front

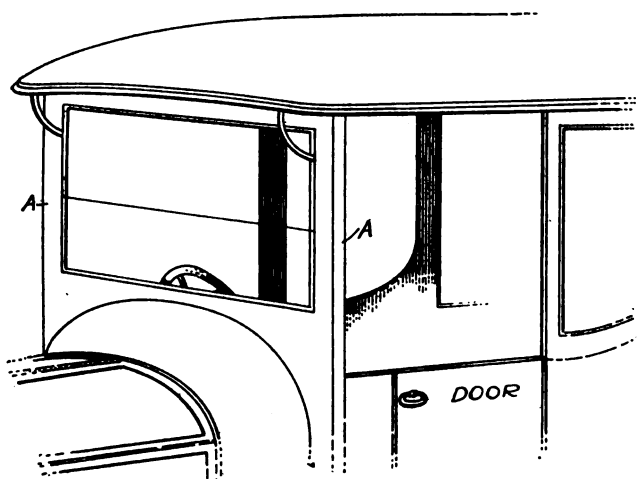


Fig. 2.

post the design will not look patchy and when the warmer weather returns all this can be removed and the car returned to a semi-enclosed.

Fig. 3 shows a new design of runboard shield that has come into existence with the full enclosed and flush sided bodies. These bodies are made to continue the turn under line down to the bottom and consequently are wider than the chassis. This offset or understep of the body over the chassis width is taken care as shown on Fig. 3 by having a runboard shield come out level or nearly so with the bottom line of the body. This will bring the side of the shield about

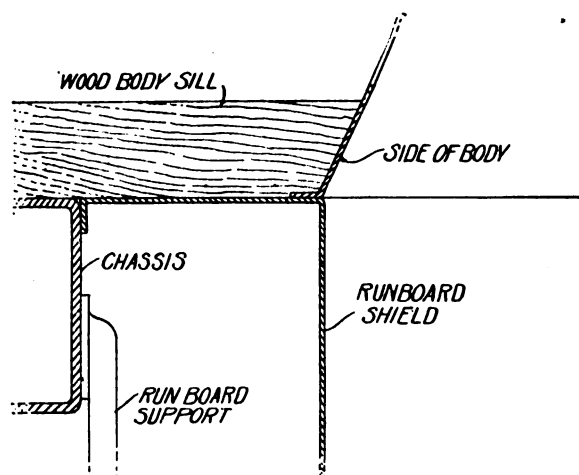


Fig. 3.

perpendicular up from the inside of the runboard and level on the side with any casing that may be put over the front end of the rear spring. All the runboard supports are covered and the side of the car between the body and the runboard has a clean appearance. To prevent the shield being damaged by those entering and leaving the car, a small plate or casting is placed directly beneath the door on the runboard.

Never screw a spark plug into place too tightly when the motor is cold, as when it heats up the insulation may break from the expansion.

Wise Garage Suggestions.

Beginning last month Wisconsin garages came under new State regulations, found in a set of uniform rules that are pioneer practice. The thirteen rules are based on conflagration experience in the State and have been sent to fire department chiefs and garage owners. The rules follow:

None but fireproof buildings should be used as a garage; never any building, part of which is used for public meetings.

The floors should be of cement.

Heat with steam. Allow no flame, fire or fire heat, stove, boiler furnace, forge or torch in the garage.

Use electric incandescent lights, protected by wire basket guard; never use lamps, candles, lanterns or other open lights.

Store all gasoline in an approved underground tank, equipped with standard pump. Never keep gasoline in an open vessel or allow gasoline to run or drip on the floor or into drainage system.

Use approved safety cans or approved portable tank in transferring gasoline to cars.

Make sure that gasoline tank in the car is free from leaks and that the caps are secure.

Provide standard metal waste cans on each floor, especially near the work bench, for oily waste. Destroy this waste every evening.

Allow no shavings, refuse or waste to accumulate.

For private fire protection, keep pails of sand with scoop and approved chemical fire extinguishers on each floor.

Beware of carburetor flooding.

Absolutely permit no smoking in the garage.

Always be careful and vigilant.

Starting In Cold Weather.

If your motor refuses to start on a cold morning after cranking it a reasonable length of time, stop and prime the cylinders with gasoline. But this will not invariably start it for there is some gasoline on the market at the present time, which is of such a low grade, that it will not start a motor, even when it is poured directly into the combustion chamber. If you are using this cheap fuel, do not blame the carburetor, as a carburetor can do nothing more than to put the gasoline into the cylinder.

There are several brands of gasoline on the market at the present time which are of high test and give good results. Investigate and make it a point to obtain the proper kind of fuel.

Puncture Sand Blisters.

When sand blisters develop on your tires, puncture them and see that the rubber is again adhered to the fabric. Unless you do this, the sand will keep working until it has separated your entire tread from the fabric and your tire will be almost useless. At least it will cost you considerable money to have it repaired. This is the case where an ounce of prevention is worth a pound of cure.

To prevent piston rings becoming gummed with lubricant, the motor should be given a dose of kerosene, applied when hot. This should be done at least once a week on a car in regular use, and the most effective method is to speed up the motor and pour in a little of the kerosene at a time at the auxiliary air valve of the carburetor.

UNJUST TO DEALERS.

Breezy Views of an Enterprising Garage and Sales Proprietor.

C. R. Zacharias, president of the Zacharias Garage Company of Asbury Park, N. J., has addressed a letter to a number of fellow-dealers with a view of improving conditions. He advises that they consider them before signing contracts for 1913. These suggestions are as follows:

First—Discount on cars and equipments 20 per cent., 25 per cent. or 30 per cent. according to quantity.

Second—Discount on parts 33 1-3 to 40 per cent. and all orders from his town referred to local agents.

Third—Demonstrating cars and cars to be used for hiring at factory cost.

Fourth—The dealer to deposit \$25 on each car ordered, which he forfeits in the event of his not taking the car. (Excepting as provided for in section 7.)

Fifth—The manufacturer agrees to pay the dealer his commission on any cars not delivered as per contract, except the failure is due to fire or accident that would cripple the plant. The same exemption being granted the dealer.

Sixth—The dealer agrees to accumulate a stock of 10 per cent. to 15 per cent. of his contract for new cars in addition to his demonstrating and rental cars.

Seventh—The dealer has the privilege of cancelling any car or cars that may be due him at any time he has his 10 per cent. or 15 per cent. of new cars in stock, in addition to his demonstrating and rental cars.

Eighth—The manufacturer agreeing to give us a three to five year contract.

Ninth—We to have one-half commission on cars delivered in our territory within 30 days of sale being made, said commissions to be paid by the factory and deducted from account of agent who makes the encroachment.

Tenth—Make commissions retroactive; others give 20 to 30 per cent.

Eleventh—The tires we use on demonstrating cars to be furnished by tire makers at factory cost.

As a sort of postscript to the suggestions, Mr. Zacharias says: "I don't want to see all the profit of production stop at the factory door. It ought to pass along, some of it, to the workers."

Mr. Zacharias is full of energy and ideas, which are reflected in an uncommonly complete establishment, which at this time gives employment to 77 persons. It comprises a garage, with a capacity for 180 cars, a repair shop, a supply department and a sales-room and office. They are not of the every-day sort, and evidence of Zacharias's ideas are everywhere apparent.

Mr. Zacharias is firm in the belief, as his suggestions indicate, that the dealer, particularly in the small town, is not obtaining a fair share of the industry's prosperity.

He says: "At best, dealers in towns of this size are doing well if they sell half a dozen cars each year, and we'd starve if we depended solely on the sale of cars; most of us earn more on the sale of gasoline; but let me tell you that the item of depreciation on their demonstration cars alone is sufficient practically to wipe out the profit of 15 or 18 per cent. which is accorded dealers by manufacturers. Being located in a summer resort, I myself am able to use my demonstration cars after they have served that purpose for rental use and in that way am able to do better than

dealers less favorably situated. But the loss on demonstrators is real, and earnest, and heavy; it eats up most of our profits. So far as I am concerned, I will not handle automobiles another year unless I am accorded discounts better than those which now prevail.

"Why shouldn't we obtain better figures? Not all of us are blind, and we can see the evidences of huge profits and enormous wealth amassed by many of the manufacturers, which points to a one-sided state of affairs. I do not believe that I am overstating the case when I say that the dealers of this country have furnished capital sufficient to start more than one of the now big automobile manufacturers on the road to fortune simply by giving up deposits on cars which never were delivered and, in my opinion, never were intended to be delivered, in certain cases. This deposit system, even as it now operates, operates against the dealer. It is no guarantee that he will receive the car or cars which his deposit covers and which, in many instances, have been sold and in which the failure to deliver means the loss also of the commission on the same."

"And in the matter of demonstration cars, quite apart from the matter of discounts, why are we not entitled to a special price? We are making business for the manufacturer while we are making it for ourselves, but the making is wholly at our expense. In the heyday of the bicycle, I sold Columbia bicycles, and Col. Albert A. Pope, who made them, recognized the justice of a somewhat similar condition. We taught people how to ride without cost, and here in Asbury Park we maintained a line of rental wheels. It is a matter of history and of logic that the first wheel used by a man or woman lingers in his or her mind and, as a result, many of those who rented Columbias while sojourning in Asbury Park purchased Columbias when they returned home or went elsewhere. Thus, as dealers, we made sales for the Columbia factory. Col. Pope was fair enough to admit it, and on the stock of rental wheels which we carried he gave us a special discount of 40 per cent., subject only to the condition that these rental machines should not be disposed of previous to September 1st. I am not sure, but perhaps 40 per cent. is too much to expect on a motor car, but certainly it is not too much to ask a special price on cars used for demonstration purposes, even though similar conditions might be attached.

"What I have said about cars largely applies to parts also. A discount of 10 per cent. on parts is neither fair nor profitable; and, will you believe it?" almost ejaculated the earnest Zacharias, "I had one prominent manufacturer of a light truck actually offer me a discount of 2 per cent. on parts. The offer decided me against taking the agency for his truck.

"We should have greater protection, too," he continued. "It isn't fair—in fact, it scarcely seems honest—that cars which we represent and which have been purchased elsewhere should be brought into our town. But as it is as fair for one as for the other, if a dealer in one place feels that he cannot afford to risk the loss of a sale made to a resident outside his territory he should at least be willing to share his commission with the agent to whom the sale rightfully belongs, and in all decency the manufacturer should insist that it be done. More, I believe that this policy of protection should be carried even further: When an agent has built up a demand for a particular car it is not right that opportunity should exist for taking the agency away from him at the end of a year; he should

be protected by long time contracts that will cover periods of three, or four, or five years.

"These are my beliefs, at any rate, and I know that they are shared by others. I believe that if a sufficient number of dealers will take a sufficiently firm stand we will obtain more of what I truly believe to be our due, if not our right. As it is, and as I have said in my circular letter offering suggestions along these lines, the dealer is the 'goat' and I am firm in the belief that we should be billy goats and use our horns on the manufacturers. We need the manufacturers, of course, but they need us quite as much as we need them."

PIPE BENDING.

How to Do It Exactly Right and Without Damage at the Bend.

The proper bending of copper piping, or any kind of piping, for that matter, especially for carrying control wires around wires, is not easy, the custom being to fill the pipe with sand and bend it hot, but this is

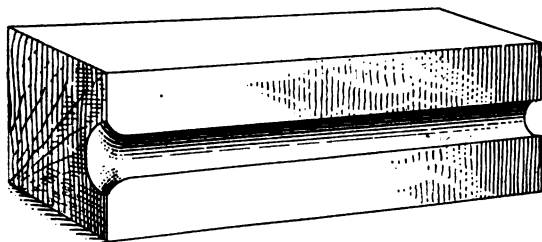


Fig. 1.

unnecessary. A vise, a blow lamp, one or two hammers, a few pieces of hard wood, and some odd bits of stout steel tube or gas piping are all that are required. Any copper pipe up to $\frac{3}{8}$ inch diameter, and of a reasonable thickness (say 20-gauge or about 1-32 inch) can be bent perfectly when cold, and as such a pipe will easily carry round a corner a cable with a breaking load of half a ton, it will be seen that no larger pipe will be needed on control work.

It is well for the amateur never to use any tubing other than "solid drawn." This is formed from an ingot of copper drawn down to the requisite size through dies, and is therefore without seam. It is quite possible to work "brazed tube," which is made

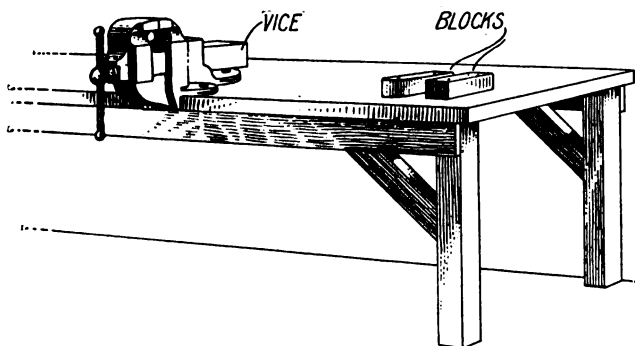


Fig. 2.

from strip metal folded up and brazed along the joint, but it certainly does not bend as easily as the solid drawn, and is liable to kink or pucker unless very carefully handled.

The chief point to remember is that copper tube or sheet, as bought, is nearly always very hard, and before it can be worked it should be thoroughly annealed or softened. This is accomplished by heating the

metal to a dull red heat—the most convenient way being to use a good blow lamp as used by painters and plumbers—and then cool the tube by plunging it into cold water. Generally, after one such treatment, a $\frac{3}{8}$ inch pipe can be bent in the hands, and if carefully and gradually brought round should not flatten appreciably. If flattening occurs it is generally owing to an attempt to bring the bend from one spot instead of spreading it over as much of the pipe as is compatible

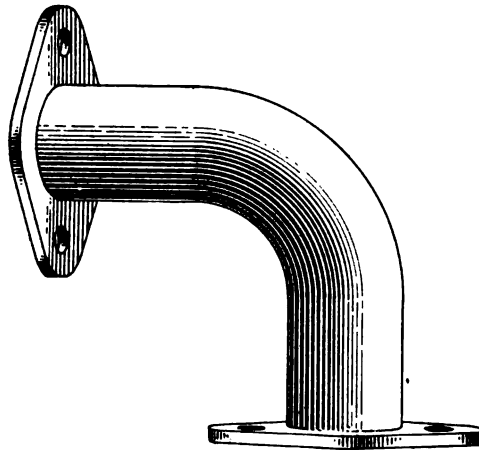


Fig. 3.

with the radius of bend required. Even if the pipe should flatten slightly it can easily be rectified by gentle tapping on the major diameter with a round-faced hammer (boxwood or fibre-faced for preference), the pipe itself being laid on a flat hard wood block.

In sizes above $\frac{3}{8}$ inch diameter, such as would be used on water or carburetor piping or casings for ignition wires, the pipe must be loaded before bending, the best materials to use being either resin or lead, lead making the work rather harder.

The pipe must be annealed as already described,

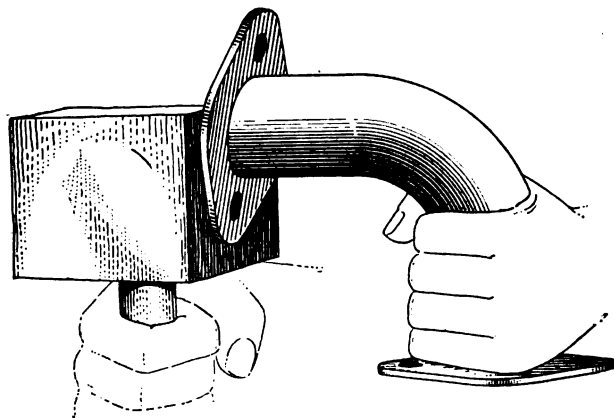


Fig. 4.

and if it be of any length and with bends in one or two places, then it is best to anneal only a few inches on each side of the required place so as to stop the pipe from bending elsewhere when pressure is applied.

After annealing, one end of the pipe should be closed with a wooden plug, or even a wad of rag or paper, and the pipe should be gently warmed all over; while this is being done the resin or lead can be melting in an old pan over the fire. The pipe is best placed on the floor, end up, and supported with bricks while the liquid filling is run in, and after it is filled up it must be left to get quite cold, after which it can be bent into any shape desired.

The actual bending can be done by fixing the pipe in the vise with a block of hard wood between the pipe and each jaw and judiciously pulling on the free end of the pipe. It will often be best to groove out each block to nearly the half size of the pipe and radius out that end of the groove towards which the bend is to come as in Fig. 1, or to nail or screw two blocks of wood to a bench (as in Fig. 2) if the vise be not strong enough for the purpose.

In this connection an experience of the writer's may prove useful. When he was called upon to bend a copper pipe of 1½ inch diameter and of fairly heavy gauge the only vise available was a portable one on three iron legs and much too rickety to be of any use. Neither was a strong bench available, but the pipe was successfully bent by jamming one end of it in the convenient fork of an adjacent apple tree.

It is much better to work with a long piece of pipe,

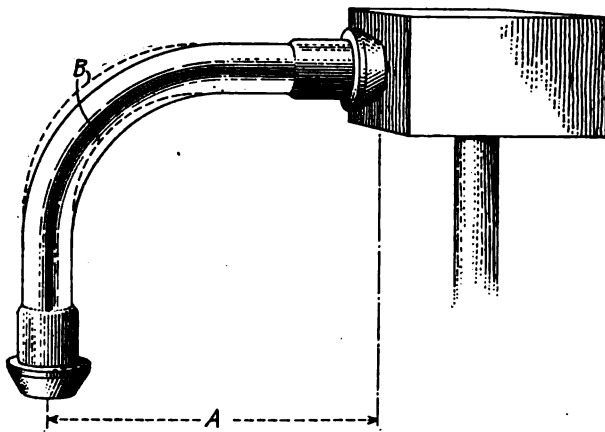


Fig. 5.

and after the requisite length at one end is bent, to cut it off; this enables a good leverage to be obtained, and so lessens the pull required. If, however, only a short piece of pipe be available it is often a great help to slip over the free end a length of gas pipe or steel tube. The end of this "lever tube" should be rounded off inside so as not to cut into the copper, and it should be as good a fit as possible over the copper pipe. It may be found that the pipe will slightly pucker on the inside edge of a sharp bend,

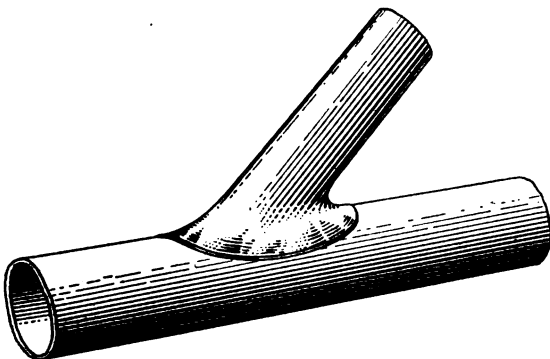


Fig. 6.

but these puckers can be tapped out with a ball pene hammer while the filling is still in.

When satisfied with the bend, the filling can be melted out by heating the pipe up and down with the blow lamp while it is held with the open end downwards either in the vise or by a pair of tongs. The same filling can be used over again, and so it is worth catching in the melting pot. Unless the bend is extremely simple, it is always best before starting, to

bend a piece of wire which is stiff enough to keep its shape into exactly the shape of the finished pipe. This forms a template to work to and saves carrying the pipe around and trying to fit it on the job—nearly always an awkward proceeding, if not impossible in some cases.

After the pipe is bent and cut to length and emptied then any flanges or unions necessary can be brazed on. A tip worth knowing to keep the brazing from

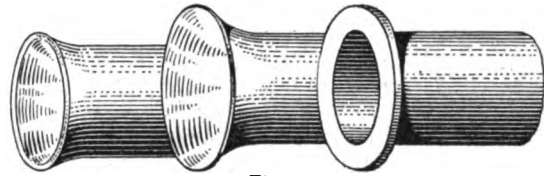


Fig. 7.

running over any parts where it is not wanted is to paint them with a paste of black lead and water.

One great thing to remember is to get the bend exactly right before unloading, and not to think that any mistakes can be corrected after the flanges or unions are brazed on, or that these can be brazed on askew to set matters right. Such methods always denote a bad workman.

Should, however, the pipe not fit exactly in its place with the unions on it, even after taking all the reasonable care, then small corrections can be made by holding the pipe in one hand by one end and gently tapping the flange or union at the other end with a block of wood or a mallet. For instance, suppose a pipe fitted with oval flanges at each end, and which

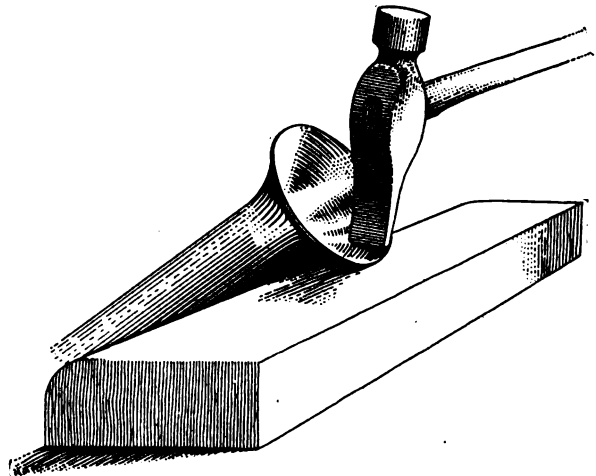


Fig. 8.

should be as in Fig. 3, had come out like Fig. 4 owing to one flange having slipped in brazing, then by holding the lower end in the hand and gently tapping the top end where the mallet is shown it will in all probability be brought to its correct shape. Or again, suppose a pipe fitted with coned unions at each end (Fig. 5) had the distance X too great, tapping the top end with a wooden block would correct this by tending to bend the pipe as shown by the dotted lines.

Although the ability to make these slight sets is very useful it must not be indiscriminately resorted to, because in all cases where any real correction is needed it is better and quicker in the end to reload and rebend the pipe. Never hammer a pipe to bend it, for even if it be loaded such a course would only flatten it without bending; always, therefore, bend by applying pressure to one end while the other is fixed.

Should a pipe require flanging at one end, say to

make a Y joint, as Fig. 6, then the one end must be beveled off and the edges spread out by hammering, over the edge of a wood block with either a ball or a cross pene hammer until one pipe fits snugly round the other. A complete circular flange can be formed on the end of a pipe by first tapping into it the ball pene of a hammer and then gradually working the metal over a little at a time all around with a cross pene, the various stages of such a flange are shown in Fig. 7 and the method of working with wood and hammer in Fig. 8. In flanging of this kind make it the rule to work all the metal round gradually until the desired shape is obtained holding the pipe in the hand and not in the vise.

Nothing hardens copper like hammering, and if during flanging it is noticed that the metal is not coming out into shape readily than re-anneal it or it will probably split.

In conclusion, when working on a pipe with union nuts do not forget to see that both nuts are threaded on and the right way round before the union ends are fixed.

SELF STARTERS.

With Particular Reference to the Use of Acetylene Gas.

According to an English authority, crude acetylene, such as is obtained from the ordinary generator, is not suitable for self-starting purposes. It contains sulphuretted and phosphorated hydrogen; the former burns to sulphuric acid, with consequent corrosive action, and the latter renders acetylene very inflammable, with the result that the explosion is too rapid. As dissolved acetylene is pure, and as it is under pressure, rendered low and constant by a reducing valve, the advantages of its use are obvious. In the use of acetylene for starting there are two principal problems involved. One is to get it into the proper cylinder or cylinders and the other is to ensure its proper mixture with air. The explosive range of air and acetylene is very wide compared to that of gasoline vapor and air. The explosive range of acetylene and air is said to be from 3 to 50 per cent., that is to say, a mixture consisting of $2\frac{1}{2}$ parts of acetylene and 97½ parts of air would explode, and a mixture of fifty parts of acetylene and fifty parts of air would also explode, and, of course, any mixture between these limits; but it is by no means the case that any mixture between these limits will do for starting. If the mixture is in the neighborhood of the upper or lower limits the explosion is not sufficiently powerful. The explosive mixture which gives the most powerful effect is a 12 per cent. one, and to obtain successful results a mixture somewhere about this proportion must be used.

This English authority says that the practice in the United States is to allow pure acetylene to enter the engine cylinders, and is caused to mix with what air exists therein. In his opinion, which is based on extensive experiment, this system is far from conducive to the best results, because the air in the cylinders of the engine not only varies greatly in quantity—it may be under compression—but it may be to a greater or less degree already carburetted by gasoline vapor, and if pure acetylene in an indefinite quantity is allowed to enter a cylinder which already contains almost sufficiently carburetted air, the risk of obtaining a mixture too rich to give sufficiently powerful effects is great. A system which ensures much more certain results is one in which the acetylene is diluted to a certain extent with air be-

fore it enters the engine cylinders. This system has several advantages. In the first place it makes use of an explosive mixture, and therefore does not require the special mixing arrangements inside the cylinders which had been found necessary when using pure acetylene in order to ensure the thorough mixing of the gas with the cylinder contents, and in the second place, the use of acetylene being optional, the mixture, if it should be found to be too rich, can be further diluted.

In order to get the mixture to the right cylinder, that is, the one whose piston is on the firing stroke, a simple plan is to have a pump for each cylinder, and as the pumps are small the whole may be combined in a unit and made to form quite a small and neat fitting, and with this pump low pressure acetylene can be used and the amount of mixture be accurately measured and delivered in definite quantities. Obviously the advantages of such a device lie in its extreme simplicity and in the fact that it can be fitted to any car without vital alteration to the framework or engine. The amount of acetylene gas used is extremely small, as may be gathered from the fact that the acetylene supply opening, to the pump, is very slightly larger than the opening in a large size burner, so that the amount of gas used would be rather less than that used in two head lights kept burning during the period of operating the pump—a matter of seconds of course. Dissolved acetylene provides acetylene lighting in its most convenient form, and the same supply can be made to answer the double purpose—and simultaneously—of starting and lighting.

It would be futile to attempt criticism against the effectiveness of the electric and compressed air starters but when the fact is considered that, with modern carburetors and ignition systems, one pull over of the starting handle is in many cases sufficient, the question arises whether the complication and weight involved in these systems is not in the nature of using a steam hammer to drive a tack. It is a good claim for the compressed air system that it gives tire inflation, but the detachable wheel has reduced roadside requirements in this direction with a consequent reduction in percentage of its advantages. The electric system combines electric lighting and the acetylene system acetylene lighting.

In connection with the electric system it is a question how long the batteries stand the heavy overload. In a recently published chart that something like half a horse power was required to turn an engine of medium size at a moderate starting speed. Now, 0.5 h. p. = 373 watts, and for a 24 volt battery to give an output of 373 watts would necessitate a discharge at the rate of 15.5 ampères, a serious demand from a battery the normal rate of discharge from which is two to three ampères.

Among other self starters at the present mement a prominent one is in the form of a spring starter. Given an engine in perfect condition and ready to start on the first pull over, this system should be effective and reliable, but it can claim no pretension to facilitate starting in the way the acetylene starter excels, when, owing to some slight self-curing fault, difficulty is experienced in getting the engine to pick up on its own carburetor.

Always carry extra plugs. If you have a single-cylinder motor carry at least one extra plug; if a four-cylinder, carry at least three extras, and whenever one of these extras is put to use, purchase a new one to take its place immediately.

The only reasonable speed law is to allow the driver to operate his machine at what is a safe and sane speed, according to the conditions.



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1007 Uses too Much Lubricant.

From H. L. Parker, Massachusetts.—I have a 1910 Herreshoff touring car with American and British ball bearing motor. I use a gallon of oil for every 175 to 200 miles. The oiling system is circulating splash feed. The exhaust shows little if any smoke and gives no trouble from that source but I think I am using more oil than is necessary. Each piston has four rings all above the pin.

Would a good result be produced by beveling the lower edge of one of the piston ring grooves in each piston and boring small holes in the piston, as shown in your magazine as having been done on other cars? If so, would you bevel the lower edge of the lowest ring groove.

The motor gives ample power but I feel the oil consumption is excessive for so small a motor ($3\frac{3}{8} \times 3\frac{3}{4}$).

Reply.—Had you mentioned the oil you are using, also whether heavy, medium or light, it would have materially assisted us in making a more intelligent reply. Information also of your gasoline consumption, how many miles per gallon, would have assisted us. We can therefore only make reply in a general way. The motor has been used practically three years, and unless the piston rings have been renewed during this time it is but natural to conclude that the rings and possibly the pistons and cylinders are more or less worn, which would tend to increase the oil consumption, and this more with the throttle partly closed, and less with the throttle well opened. The increased vacuum during close throttling has a tendency to draw the oil past the rings and the weaker explosions do not force the oil back past them, two conditions that tend toward increased consumption, while with the throttle well opened not so much oil is drawn past the rings and the higher pressure due to the larger volume of gas at each explosion both tend toward diminished consumption. We think that a thicker oil would probably help you, and that in all probability new rings and closer fitting pistons would prevent much of the hot gas, that now leaks past the rings, from entering the crankcase where it heats the oil making it very much thinner and materially reducing its viscosity. Not being any too familiar with this motor we do not care to advise lowering the oil level. You should be able to observe whether or not there is more smoke at nearly closed throttle than when wide open, thus proving or disproving the above. If using a heavier oil does not remedy matters, and new piston rings do not give the desired effect, the lower edge of the lower piston ring grooves could be leveled and drilled. It could do no harm, as the wrist pins are probably lubricated entirely by splash rather than

through hollow wrist pins the pressure on the oil being obtained by a ring below each piston pin. Your motor has no such ring below the piston. One gallon of oil to 175 or 200 miles seems excessive unless you are able to run much further on one gallon of gasoline than we think. One pint of oil to five gallons of gasoline should be sufficient for your motor, unless the oil is consumed in the crankcase, or there is insufficient splash to lubricate every part sufficiently.

1008

May Be Poor Gasoline.

From C. A. McDaniel, Mississippi.—I have a two-cylinder 1911 model Maxwell, and it always has run nicely until a month or so ago. It seems to lose power on hills. It will speed on level roads. The compression is very good and I don't see what the trouble can be. Mornings the motor will not start until the gasoline feed is adjusted, and even then sometimes it will run an hour or so and the carburetor may be adjusted. It will run very well, with the exception of losing power on hills, until the carburetor has to be adjusted again.

Sometimes the motor will back fire when the switch is off. This occurs after the engine has been run for a while.

Reply.—From your description of the symptoms we are inclined to the belief that your gasoline contains water or dirt, or both. We suggest that you wash your tank, gasoline piping and carburetor float bowl with gasoline and never put gasoline into the tank without straining it through a dry chamois skin. Your description of "very good," referring to the compression, may mean good or fair. If not good, or there is any apparent leak of your compression, that is, if it is at all impaired, you should not expect satisfactory operation. It should not be necessary to make frequent carburetor adjustments, after proper adjustment. You did not say what carburetor you were using. If you will not give sufficient information to enable us to help you it is certainly not our fault if replies are unsatisfactory.

1009

Poor Compression.

From F. J. Cook, Indiana.—What is the matter with my car. When I start out I dare not advance my spark lever until I have run about two or three miles. If I do, it will jerk. Even when I strike a good, level, smooth road, where the machine runs quite easily, it will begin to jerk. I have a two cylinder Reo 1909 make, five-passenger. One cylinder has weak compression. I run on dry battery. I had the valves ground in the weak cylinder, and dressed up the platinum points, but it did no good. I would like your advice.

My engine starts easily except when it gets well warmed up and I stop for five minutes, then I can hardly get it started.

Reply.—You must have good compression if you want satisfactory running. This means a new cylinder, new rings and possibly a new piston. It is the only remedy. Hard starting with the motor hot shows conclusively that at least one cylinder has poor compression.

1010

Has Magneto Trouble.

From Kenneth F. Beers, Indiana.—Through widespread publication of your troubles often comes relief, and with this in mind I wish to tell my troubles. I have a 1910 Flanders 20 which has been run 6000 miles. Bought new in 1911 with inspection tags show-

ing that the machine was finished in December, 1910; Splitdorf magneto and coil. Have had magneto trouble the past three months. Never have spark plug trouble; plugs always clean and never an intermittent miss. In three months I have been pulled in three times owing to electricity stopping instantly—not missing and then stopping, but stopping without warning. A local factory here makes magnetos and coils. Their men have had the magneto off and all apart three times; also the coil tested and pronounced O.K. About a month ago after one of these “being pulled in” event they fixed things O.K. and soon after I discovered that the magneto was losing electricity on low speed on high gear. I could not run on the magneto at less than 6 miles per hour, but switching to the battery when below this speed on high, made the engine run perfectly. I adjusted the spark plug points and circuit-breaker points in an endeavor to get the best possible result on low speed and have been running since, first on battery and then on magneto, depending on the speed and pull. Sent the machine back to the same people after discovered this trouble and they remagnetized the magnets. It ran all right for 100 miles, when I discovered the same weakness appearing. Has since then been getting weaker and now will not run on the magneto current at less than 9 miles per hour. There seems to be a difference at times in the speed required to run on the magneto, but probably this is because owing to good roads or bad the engine does not run as fast or slow as I imagine it is doing. But under ordinary conditions the speed tests referred to have been made with the speedometer. The Splitdorf people say in a letter that they think trouble is with the coil and advise sending it in.

Now, for another trouble. This cost me several dollars for the Studebaker branch to experiment with, and, except for the first hour after they repaired the same, the trouble is as bad or worse than before. My car is two speed forward and in going from low into high there is a terrible jerk or sometimes a succession of jerks, as, (apparently) the clutch engages the fly wheel. “It sounds just like the clutch grabs,” says the Studebaker expert, but as they had taken that part all out and dressed the leather again and made a perfect fit they said it could not be there. There is no play either way in the bearings at either end of the drive shaft. These I examined last week—taking up some wear in the ball bearing on the countershaft in the transmission gear case, and also testing everything in that connection. There was no more play than necessary and the gears mesh properly and have plenty of grease. The clutch takes hold easily on low—a little more positively on reverse, though this is not the fault of the clutch, and if in running you disengage the clutch for a few moments and then let it back in, it engages smoothly. If you let the car slow down when you thus disengage the clutch with the engine running as before, the jerking is exactly as when going into high. I have tried to engage very slowly and gently, and can sometimes do it, but again the very slowness brings on a succession of jerks that sound badly as well as worry the driver.

The only solution now in my mind for this is that possibly the frame that supports the universal joint housing may be very slightly loose on its main frame connections and I have tried to discover a slight movement here when running and throwing the clutch in and out. There seems to be a slight opening around the joints—dirt and grease seem to be slightly jarred in so that the two parts would seem to move one on the other just a little. However, this trouble, if

trouble at all, was there before this clutch trouble began to make itself known. At first, neat’s foot oil seemed to remedy the matter but it is now beyond the healing influence of that remedy.

I have had two other repair men look at the car but they all say they cannot tell without taking it down and examining. The other fellows, who should know all about their own cars did that and now it is worse than before. So, if you can help me locate the trouble, I will try to run along till I take the car down this winter for an overhauling.

Reply.—Your magneto is probably a Splitdorf Model F. Inquirers will kindly state the model of their magnetos, as the company make a dozen or more different models, and it is sometimes difficult to find out just what model is being used on a particular car. We advise you to send the coil to the makers as suggested. There may be a defect in the switch, or the wiring may be incorrect, allowing the battery to discharge through the magneto armature, demagnetizing the magnets. The fact that you can run on the batteries without missing would seem to indicate that the distributor and secondary current are both free from trouble, as well as the coil itself. You may have overlubricated the magneto, or may have attempted to lubricate the parts of the interrupter. If you will clean the interrupter box carefully, smooth up the contact points and adjust them, you may be able to remedy the trouble. If the magnets have become demagnetized it means re-magnetizing and removing or remedying the cause of the trouble. You may have to put a new clutch leather on the cone. It may also be necessary to line up the transmission with the crank shaft, for unless the alignment of the two is correct the clutch will always give trouble. A little neat’s foot oil will soften the leather, and a very little linseed oil will make the clutch hold. A slipping clutch will burn the leather so that all kinds of trouble will result.

1011 A Rich Mixture and Overheating.

From J. G. Gompert, Nebraska.—In all three of the issues of your magazine which I received, you say in different places that a rich gas mixture will cause a motor to overheat. I operate a 30 h.p. Cartercar and in the instruction book that came with the car it says under the heading of “Motor Overheating”: “A very common cause of overheating the motor and boiling the water is a thin mixture. A great many motorists are not aware of this, believing that a rich mixture will cause excessive heat, which is not so; when a mixture is so rich as not to explode quickly it will not explode at all, and no excessive heat is generated. This is not the case with a thin mixture, for when the supply of gasoline becomes too low in proportion to the air, the charge instead of missing entirely or exploding quickly, burns slowly and continues to burn; with the result that a great deal of heat is generated by the long burning.” In the September number of your magazine you express practically the same thing when you say under “Carburetor Backfiring”: “A weak mixture is a slow burning one,” etc. I would like to have your further opinion on this.

I have had a little trouble with my car lately in the way of motor missing: For instance, when I come to a hill and open the throttle suddenly (on low) it will go chick-ke-chick, chick-ke-chick, till I throw out the friction and let the motor race for a moment, when it will pull good. It also does the same thing when I’m running along on level road at a slow speed, and come to a slight down grade, when it seems that the car wants to run faster than the engine and it

misses till it has to pull again. Can you enlighten me on this? My car is equipped with a Brush carburetor and Splitdorf Model D magneto and non-vibrating coil.

Reply.—We only reiterate that what was said in our September issue with reference to overheating as a result of too rich a mixture, as we do not believe that a mixture too thin can cause overheating, no matter who claims to the contrary. It is an accepted theory that the greatest power can be obtained from a mixture slightly richer than one which will produce absolutely perfect combustion. It is quite generally conceded by observing gas engine operators that what is known as a "gas knock," is caused by an excess of gasoline vapor, with the motor very hot, rather than by a mixture too thin. Just why is a disputed question, but our theory is that the too rich gas overheats the motor, and that pre-ignition is caused as a result. In the use of kerosene where the engine has to be run very much much hotter than with gasoline, the usual course is to use water vapor with the combustible mixture to prevent "knocking." It is true that some carburetors, proverbially wasteful of gasoline, have to be adjusted for a rich mixture in order to get a mixture sufficiently rich at all times. In other words the mixture produced is by no means uniform, varying from just rich enough to exceedingly rich, and if such a carburetor were adjusted to furnish a more average perfect mixture and consume the gasoline with some sort of economy, there would be times when the motor would be "starved." A slow burning mixture does not necessarily cause excess heat as you may observe by increasing the air supplied to a Bunsen burner after the proportions of air and gas are correctly adjusted. You do not state the make of your car, although you specify that it is equipped with a Brush carburetor and Splitdorf Model D magneto, and for this reason we are unable to help you as we might. However, the symptoms described would seem to indicate that the gasoline is not thoroughly vaporized, condenses between the carburetor mixing chamber and cylinders, and on opening the throttle suddenly the motor is choked with excess of unvaporized gasoline. This might be caused by insufficient velocity of the air past the vaporizing nozzle, or a carburetor adjusted to supply too much gasoline at low engine speed. Reducing the air opening past the vaporizing nozzle sometimes will remedy this condition. Excessive clearance between valve stems and guides will sometimes cause leaks of air to the cylinders sufficient to reduce this air velocity past the nozzle at nearly closed throttle, when it becomes necessary to increase the fuel at slow speed, not all of it being completely vaporized.

1012

Hard to Start.

From W. M. Stubbs, North Carolina.—I would like you to tell me what the matter is with the ignition apparatus of my car? I own a Buick Model C, and Sept. 1 I drove about fifty miles and the car worked fine; never better. Some eight or ten days afterward I turned on the gasoline, threw in the switch, and started cranking. I cranked and kept on cranking, but not an explosion could I get, so I concluded the battery (ordinary cells) was dead. They tested from 20 to 25. I then thought there was a broken battery wire and put in new wires. I tried again with no better results. I then decided that the spark plugs were sooty, so I took them out and cleaned them but with no better results. I then took the timer down and

cleaned that; still no better. I then concluded that there must be a broken high or low tension wire. I examined them all and they appeared to be all right; and yet no results. I use dry cells and Kingston spark coils and both the Rajah and the Mosler spit-fire plugs. I will also state that Sept. 1, the last time this car was run, was one of the hottest days of the season. Kindly tell me what the trouble is.

Reply.—We are very much afraid we will be unable to give you sufficient information to enable you to operate your car satisfactorily, as it would probably necessitate our describing the fundamental principles governing not only ignition, lubrication, carburetion and gas engine construction, but a mass of detail that can only be learned from experience, or a course in training, to enable any one to correct faults preventing an engine from starting. In the first place your car is a very old model, one that comparatively few now know much about, consequently it is to be presumed the cylinders and pistons, as well as other parts of the motor are pretty well worn, and it is quite probable that the oil pack between the cylinder walls and piston rings is broken and you do not have any compression. There are three conditions that must always be present for a gasoline engine to start, viz.: A good spark occurring at the right time; a proper mixture of gasoline vapor and air in the cylinders, and good compression. You have not told us whether or not you get the sparks at the plugs, which you could easily have observed by removing them and allowing the metal shells to lie on the cylinders with the wires attached. You also failed to say whether or not you have good compression. It therefore looks to us like practically a hopeless case to attempt to make an intelligent reply, as there are perhaps 50 or more reasons why a motor will not start.

1013

Kerosene for the Radiator.

From R. E. Carter, Nebraska.—How is kerosene used as an anti-freeze? Will it get hot enough in the radiator to explode? At what point will it boil?

Reply.—The boiling point of kerosene should be 170 degrees Fahrenheit, and the point at which it creates explosive vapor, or its flashing point, is 149 degrees Fahrenheit. It is not recommended to prevent radiator freezing.

1014

Oil and the Magneto.

From J. A. Seavey, Oregon.—I undertook to fix a Bosch magneto that had been flooded with oil but I failed. I washed it thoroughly with distillate, but the result was not satisfactory. What is the proper thing to do in a case of this kind? This magneto is in use on a street roller manufactured by the Austin Manufacturing Company.

Reply.—Clean oil cannot injure your magneto, except to prevent a good contact between the contact points in the interrupter box, but oil carrying particles of iron and carbon, if in sufficient quantity, will short circuit both the primary and secondary currents. We advise you to send the magneto to the nearest Bosch agency, which is at 357 Van Ness avenue, San Francisco, Cal., as the entire magneto will have to be disassembled and cleaned, an operation not to be undertaken except by those thoroughly understanding Bosch magnetos. If gas engine manufacturers were made to realize the trouble that may be caused by flying oil and grease, they would be more particular to protect the ignition magneto.

1015 **A Squeaky Sound.**

From S. A. W., Pennsylvania.—My Overland car Model 69, 1912, when pulling hard on high, has a squeaky sound in the universal joint or clutch. Plenty of grease seems to be there. If thrown in the second, after a short time, the squeak also begins. If I go to low there is no sound. What is the cause of the noise and where can it probably be located?

Reply.—It is hard to locate squeaks of this kind, but it will quite likely be found in the clutch, which slips slightly at all but low speeds. We hardly see how a squeak could result from the universal without heating to such an extent as to be observed.

1016 **Certain Ford Car Suggestions.**

From Dr. James J. Drace, Missouri.—I have a Model T Ford touring car, 1912 model. Can I use a different "driving pinion" and lower the gear ratio and increase the pulling of the car on high in sand and mud, of which we have one or the other all the time? I would not care for more than 25 miles per hour maximum speed. Is there sufficient oil in crank case when it runs from the lower pet cock? And how much oil should be added after running 25 or 30 miles? Or in other words, how much oil should be put in the engine when level with the lower pet cock? Would higher than 62 proof gasoline give better service? Would you advise the use of the preparation I notice you mention now on sale to increase the power of the engine? In regard to the different gear ratios, what is the difference in speed and pulling of 20 or 30 h.p. engines at 3 to 1, $3\frac{1}{2}$ to 1, 4 to 1 or $4\frac{1}{2}$ to 1?

Reply.—You can only change the gear ratio of your car by changing both the pinion and driven gear, reducing the diameter of the former or increasing that of the latter. Your plan would be impracticable, for the driving pinion now has about the minimum number of teeth allowable, and there is insufficient room to increase the number of teeth in the large gear. Reducing one or increasing the other would necessitate different shape of tooth all around, different angles, etc. If you want more power at the expense of speed, why not run on slow speed? The Ford car is driven 27 inches at each revolution of the motor, and this is less distance than the average cars of its class. Moreover, such a change, if possible, would be expensive, and as to that matter, speaking in a general way, we never advise changes in the construction of automobiles after they are sent out from the factories. The manufacturers spend a good deal of money and employ experienced engineering talent to design their cars so that they will best meet the requirements of all conditions of roads and speeds. To attempt to improve them is always hazardous.

As to the lubrication of your car, there should be about a gallon of oil in the crank case when ready to start. There are two drain cocks in the fly wheel casing or oil reservoir. The oil level should be carried between these two cocks. If it runs out of the upper one, there is too much oil and it should be allowed to drain out to that level. If on opening the lower drain cock the oil does not run out, a larger flow is needed. If you will send to the Ford Company they will mail you an instruction book which gives detailed information as to the lubrication of your car, and this is far more comprehensive than any information we could supply you. There are more heat units in a gallon of 62-degree gasoline than in one gallon of 76, hence more power. The 76 would start easier, but if your carburetor is correctly adjusted, and is adapted and proportioned to your car, as we pre-

sume it to be, there are more miles in the heavier grade, the 62.

We do not know what preparation you refer to as having been mentioned in this magazine to increase the power of the engine. In anything of this kind there are both advantages and disadvantages, and it is probably a matter of opinion as to whether such preparations are desirable in all cases. Such mixtures are usually expensive, and the fact that automobile manufacturers rarely, if ever advise their use, should be considered by you. With reference to speed ratios, the law is "the higher the speed the lower the power." A ratio of 3 to 1 means three revolutions of the crank shaft to one of the rear wheels, while $4\frac{1}{2}$ to 1 would give you theoretically 50 per cent. more power delivered to your rear axle at 50 per cent. less speed. You would pull 50 per cent. harder and car would travel 50 per cent. slower at the same engine speed. Finally, the Ford car is a powerful hill climber and a good puller on bad roads. Here follows a story of this car which is probably true: "Out of Milwaukee a while back," said the fat Ford chauffeur with the double chin, "they took a little old regular Model T out of stock, like taking a \$2 derby off the shelf for a hired man, and put her in a hill-climbing race against a lot of big 40 and 60 and 90 h.p. cabooses, and after she had scooted in first, saying tut, tut, in a reproving, chiding sort of way to the field, one of the big 60 h.p.'s protested the result on the ground that the Ford was undersized. Even the late lamented Goliath was a better sport than that. When little David soaked him in the ear with that dormick he laid right down and died like a gentleman, without saying anything about David having taken an unfair advantage of him by being so much smaller."

1017 **Two Singular Queries.**

From W. H. Unke, Jr., Wisconsin.—I wish that you would write me and give me the correct answer to the following questions:

1.—In the case of a motor bored for a 4-inch piston, having a 5-inch stroke, equipped with a 2-inch exhaust valve and exhausting through a $1\frac{1}{2}$ -inch pipe, and the same cylinder, same bore, same stroke and same exhaust valve exhausting through a 2-inch pipe, which of these has the exhaust leaving at the end of this pipe under greater pressure and velocity and which of the two crack loudest?

2.—In testing with a mercury tube for back pressure or loss of motive power, is there any way of computing accurately the horsepower loss on a mercury tube measurement of inside diameter being (7-64ths inch) seven sixty-fourths of an inch? For instance, if test shows fluctuation or a rise of a half inch, how much loss of power would this indicate if measured in size of tube as given?

Reply.—1.—Your inquiry could be well answered by asking you which would discharge the more water, a $1\frac{1}{2}$ -inch pipe or a 2-inch, and in which would there be the higher velocity, assuming that both pipes are the same length. 2.—The mercury tube is only of use to register the amount of back pressure. Loss of power can only be determined by means of some mechanical appliance such as a dynamometer, water brake, Prony brake, etc.

1018 **Electric Light System.**

From E. L. Godfrey, Michigan.—I am using a Ford runabout which is equipped with an electric lighting system, which is run by current derived through the magneto in the ignition system of the car. It is pretty satisfactory on the higher speeds but not so on the lower,

which on bad roads make it necessary to take frequently. I would like to know if it is practical to use a storage battery for that purpose and if it could be charged from the lighting system of my car house. I would like to know also the most desirable one to buy, the size and weight as well as the cost of same.

Reply.—The voltage of the current generated by your magneto rises as the engine speed increases, consequently the faster your engine runs the brighter will be the lights. If you reduce the voltage of your lamps they will be brighter at low speed than now, but will probably burn out when the motor speeds up. You can use a storage battery and charge from the lighting system of your car house only if it is direct current or you have means for changing an alternating current to direct. Storage batteries are advertised in every issue of this publication. We could not make any selection for you. Properly installed you could use your present system when running at good speed and by means of a two-point switch use current from the storage battery for slow running. This would materially save battery current. This would allow of the use of a much smaller battery, cheaper to install and much lighter. A 6-volt 60-ampere hour would probably be sufficient, but if you intend to run constantly on storage battery it will be better to use a 6-volt, 100- to 120-ampere hour.

1019 **Electricity for Lighting.**

From L. M. Tuttle, Illinois.—I have a Model T Ford car and use electric lights. The electricity is generated from the magneto. I think it a good light when running 15 miles or better but for slow running, or crossing some bad bridge or mud-hole, where I need the most light, I have the least. Could I use some kind of storage battery for the lighting that could be charged by the magneto? If so, what kind and how connected?

Reply.—See reply to E. L. Godfrey, Michigan, in this issue. Your magneto generates alternating current, therefore you could not charge any kind or type of storage battery from it, unless you used a rotary transformer or rectifier, neither of which would be practicable.

1020 **Spark Lever Trouble.**

From Worley Adams, Georgia.—I have a Flanders roadster and get the very best service seemingly, but when advancing or retarding my spark lever seems to get no results; that is, when I advance the lever my engine gets no faster and when retarding the lever the engine gets no slower. Where and what is the trouble?

Reply.—Your car is equipped with Splitdorf dual ignition, which has variable timing. If your magneto timing arm does not move as you change the position of the timing lever there is some trouble or disconnection between the two. If the timing arm responds to the movement of the spark lever the timing is advanced or retarded. It may be that due to wear there is so much lost motion that the magneto timing arm does not move at all or very slightly. If such is the case a spring attached to the arm and to some part of the car or motor could be installed to take up lost motion in either the retard or advance. If such is the case the spring would act in one direction and the lever in the other, each pulling against the other.

1021 **A Cylinder Misses.**

From John Seitz, Wisconsin.—I would like to ask a question about my Sears car; two-cylinder opposed with Schebler D carburetor and Noxon coil with battery ignition. When starting one cylinder most always misses.

At first it runs on one cylinder for about a minute or so, then the other cylinder will catch and then not another miss. The compression is good. Can you tell me the cause of this?

Reply.—Troubles such as you are experiencing are, no doubt, responsible for the general abandonment of double-opposed-cylinder motors. The heavy gasoline of today is one of the causes for irregular operation, while excess lubrication for one of the pair of cylinders is the other principal cause of your trouble in all probability. The Schebler D carburetor is not their best model for motor car use. Some owners have equipped their cars with a carburetor for each cylinder and report very much less trouble. Leading heated air from about the exhaust also seems to improve matters in some cases. We advise the use of two carburetors installed, so there is no possibility of condensed gasoline accumulating in the inlet piping to the inlet valve chambers, using a more modern designed carburetor than the Schebler D, and possibly one size smaller than you are now using, at least one in which the fixed air has a higher velocity, in order to more perfectly vaporize the heavy gasoline.

1022 **Jumps and Has No Power.**

From L. C. A. Company, Wisconsin.—I have a four-cylinder 1912 model two-passenger runabout Maxwell car. It runs good for a while, and then it jumps and has no power on the hills. It has its own make of carburetor. I have cleaned the carburetor, the tank and the feed pipe. I have had the valves ground. Adjusted the carburetor and looked over the timer. Everything seems to be all right but the engine misses, although only when the motor is standing still. I have attributed it to the carburetor so far, but wish you would tell me your opinion of it.

Reply.—There are several causes for a motor's missing explosions when running and also when closely throttled and running idle. Among these we enumerate the following: Weak exhaust valve springs, which condition allows exhaust gas to enter the cylinders rather than explosive mixture; too weak a mixture as a result of leaks between the valve stems and valve stem guides; spark gaps of improper length; partially demagnetized magneto magnets (this condition not present except with engine-timed magnetos or magnetos generating current, which is timed by a separate timer); excessive lubrication, caused by the increased vacuum as a result of close throttling coupled with worn piston rings; blowing back through leaky inlet valves; defective insulation of both primary and secondary cables; faulty insulation of timer contacts; loose wires and imperfect primary contact; sticking vibrators; burned out condensers, etc. From this you will see how impossible it would be for us to attempt to diagnose the cause of the missing of explosions, which you say only occurs when the motor is running slow and idle, but which we say occurs to cause the jumping and loss of power on hills. A sticking float, or water or dirt in the gasoline will cause uneven running, but such a condition will usually be accompanied by "back-fires" through the carburetor. Fused or sticking vibrator contacts, or improper adjustment will also cause such symptoms as you describe.

1023 **A Coughing Car.**

From Albert E. Lyman, California.—I have a 1911 Model E. M. F. 30 roadster, equipped with a Model L Schebler carburetor, and when ascending a hill the car seems to have lots of power when starting, but when partly up, and on opening the throttle a little more, the

car seems to cough as though it was choked. Is this caused by too rich or too lean a mixture?

Reply.—It looks as if there were an accumulation of gasoline that is drawn into the cylinders as the throttle is opened. Your motor apparently does not possess a very important quality, viz.: good "pick up." With a carburetor properly adjusted for slow speed, the act of opening the throttle should give a richer mixture temporarily, to compensate for the immediately slower air velocity due to the resistance of the air, and gas caused by the throttle position previous to increased demand. If opening the throttle gives too rich a mixture the motor will choke up and slow down. It, therefore, looks to us as if your auxiliary air valve spring had too much tension, resulting in too much gasoline at intermediate or nearly full opening of the throttle. It is our opinion that the adjustment for low speed is not properly made before the attempt is made to adjust for high speed, with the result that there is not sufficient velocity to the air to properly vaporize the gasoline. The fact that this inquiry is from California might lead one to believe that your gasoline is heavier than used in the East, nearer in fact to distillate.

Some Obscure Troubles.

From L. W. Hadley, M. D., Maine.—Last spring after overhauling my Ford Model T, I found difficulty in getting it to throttle down below fifteen miles per hour on level. After having tried all adjustments of the Holly carburetor without relief, I began to make inquiries of those who had had large experience with this type of engine. Many and divers were the opinions. One man thought it must be an air leak. I was confident there was none but decided to take off and disassemble the carburetor. I found a large fly in the venturi tube. On reassembling, after removing the fly and adjusting, I could throttle down to five miles per hour.

A friend had a Model T that was possessed with very erratic firing. The spark plugs tested all right, the timer was new and the buzzers were apparently working O.K. Nothing was evidently wrong with the wiring. I applied a battery, and after cranking a few times, while the roller was off contact, made the battery connection. Great was my surprise to get an explosion in the engine. This gave me a clue to a short circuit which I found on the timer. One of the small wires had become dislodged from the binding post and was making contact on the timer casing.

Another friend had his magneto on his Model T suddenly go out of commission. On opening the transmission case we found a mass of material from the transmission bands and a piece of wire an inch long, about No. 22, lodged between the copper band connecting the coils and the coil support in such a position as to short circuit the magneto. This piece of wire was of brass but where it came from and how it got there was a mystery, possibly from the transmission bands.

Leaky Back Axles.

From Reader, New York.—I have been troubled on and off with oil working out of the back axle and through the brake drum of one of the back wheels of my car and throwing oil on to the inner side of the tire. The oil did not work out until the car had run thirty miles or so. I have at last discovered the reason, which I fancy is rather an unusual one.

Last spring I had the car thoroughly overhauled, and as the bushes of the back axle were not worn

badly enough to necessitate renewal my repairer fitted felt washers in order to stop the oil getting through. This I found did not cure the trouble, and it was still necessary to take the wheel off from time to time and wipe out all the grease from the inside of the brake drum.

On refitting the wheel on one occasion I noticed a slight grating of the brake shoes inside the drum and rightly concluded that this was the cause of the trouble, as I had before noted that this particular drum became rather warm after a long run. I then tried to put matters right by readjusting the brake but found it impossible to stop the grating noise, and at last gave it up and decided to have a new bush fitted. Then came a happy inspiration. I took the wheel off again, turned it half-round and replaced it, when I was delighted to find that not a sound came from the brake drum, and since then I have never been troubled with grease on the tire. I assume that the heating of the rubbing brake caused the lubricant to become very thin and to find its way out.

An amateur would naturally think that a wheel would run true whichever way it was placed on the axle, but I have found out that this is not always the case, and think I am right in concluding that it was not oil from the differential but melted grease from the stuffing box of the wheel that was the cause of the trouble in this particular instance. The fact that for certain periods grease did not splash out (which rather puzzled me at the time) was no doubt due to the wheel being fitted in its correct position during that period.

He Is From Missouri.

From Inquirer, Ohio.—In the October issue O. M. Currie, M. D., states that "he had a repair man come to his private garage and put on a new tire and tube, and that after the work was done he locked up the barn and went to his house." After a half hour he heard an explosion, and "on going down to the barn he found a bladder of air as large as a peck measure protruding from the edge of the rim or between the edge of the rim and the tire that had just been put on." Also, "after fifteen minutes this bladder burst and split the tube."

Seems to the writer that the doctor stretched things somewhat. For, how could he have heard an explosion, and on going to his barn found his tube still unexploded. How could a shoe explode without a tube first exploding? An explanation from the doctor would be appreciated by my little eight-year-old girl, who asked the question that I have written.

Trouble With Inner Tubes.

From L. W. Hadley, M. D., Maine.—Have automobile owners ever been troubled with the inner tubes developing small holes next the rim one after another as fast as one can repair them? I have. Three of the new tubes which came with the car when I bought it new gave me this trouble within five hundred miles and nothing that I could do could make them remain inflated more than a few hours at a time. Always a new hole. Many reasons have been given me for this trouble but I am satisfied that the proper one is poor rubber and insufficient thickness. I recently cut open a tube of one of the best makes, and found that along next the rim the rubber was not thicker than a visiting card and would tear as easily as a piece of cheap paper and this tube had been in use only a few months. The only remedy that I know of is to make one tube out

of two. Select the poorest one and cut from the part next the tread of the casing a strip about two inches wide with a pair of shears. Clean the surface of the other tube where it goes next the rim by wetting with gasoline and scraping with a dull knife the whole length and a space about two inches wide; also the cut strip on what was the inside of the tube. Coat both with cement. Inflate the tube until round and when the cement is dry enough, apply the strip, winding the tube round with a two and one-half inch bandage as tightly as possible as fast as the strip is applied, overlapping the turns about three-quarters. When completely wrapped all round firmly, inflate the tube as much as possible without danger of bursting and leave thus for an hour or more. Remove the bandage, insert at once and inflate.

Troubles Overcome.

From J. M. Paris, W. Virginia.—I am now running a Ford roadster, Model 1911, and I had considerable trouble keeping the carburetor in adjustment on account of the threads on the needle adjustment being worn and the least jar would throw it out. I tried taking the dash rod out but it didn't help it any so I got an ordinary wire staple, replaced the dash rod and drove the staple over the rod into the dash board until it tightened it and that holds the needle valve in any position it is placed. I tried getting a new valve nut but the wear was not on the set screw but in the carburetor part.

I was also bothered with loose fenders, so I got some $\frac{3}{8}$ inch round iron, threaded two pieces on both ends after cutting them three inches longer than the distance from the two inside rivets on the fender, then bent them at each end, took out the rivets, placed a nut on the inside, then put the rod through the holes made by the removal of the rivets and put a nut on the under side and drew them up tight. This took all of the rattle out, and the one in front I bent twice so as to clear the radiator, and placed a long strap on this one which holds the crank handle up out of the mud.

I always examine the steering gear and radius rod before starting on a trip and before starting down a hill try the emergency or hub brakes. Have run a car for two years and have never had an accident of any kind.

That Front Cylinder Trouble.

From E. Burnaugh, Iowa.—I would like the privilege of answering R. B. Vaughn of Georgia. I think he will find the trouble with the front cylinder is in the timer. I expect it has the same timer that was on when it came from the factory which is adjusted by a screw cap where the wire connects to the timer. The best way to fix it is to get a new timer of the rotary type because when one of those old style timers begins to make trouble they keep it up. He can get the timers all ready to put on from the Auto Parts Company, Chicago, Ill. In regard to his water boiling. I think he will find the remedy for that in the pump gears which he will find located just over the timer in a metal case along the side of the oil case in which he puts the cylinder oil. He will find a small oval metal cap held in place by a screw in each end. By removing it he will find the pump gears which is simply two cog wheels. They will probably need replacing with new ones. After having done this, I think he will find his engine will run all right and not overheat. I don't think I can help him any in his transmission trouble but if not too late, I wish he would let me know through your paper how he comes

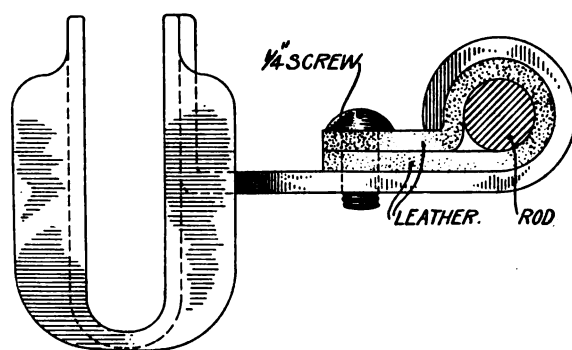
out with his troubles. He must also remember to keep his vibrators cleaned and adjusted and see that the wires are properly connected at the bottom of the vibrator box.

How the Rattle Was Cured.

From W. S. G., Massachusetts.—Having been annoyed with the rattle in my Ford Model T, and cured it, perhaps a few words about it may be of interest to some other fellow and save him some of the expense to which I have been put. I found there were three definite causes of rattling in my car, especially when operating at about twenty-five miles per hour.

First.—A rattle due to wear in the ball at the ends of the front radius rods. To cure this, I put on an "anti-rattling device" made by the Atlantic Machine Works of Brooklyn, N. Y. and have not been troubled by it since.

Second.—The rattle due to the looseness of the brake rods in the supporting brackets which are clamped onto the rear radius rods. I took the brackets off and opened up the ends where the rods



Cure for the Rattle

slide through, lined them with leather which I held in place with round head screws as per sketch. It stopped the rattle.

Third.—There was a rattle and what I considered an unnecessary amount of noise in my differential gears. Upon removing the drive shaft assembly and the drive shaft pinion, I found that the drive shaft roller bearing was minus one end of the cage which holds the rollers in place. As this part of the machine had never been apart since it came from the factory, the bearing had evidently been put in place in that condition when the machine was assembled at the factory. How any man who considers himself a workman could put in a roller bearing with one of its essential parts missing, I have not been able to fathom.

It seems to me that the Ford Motor Co., instead of further reducing its already low price for the Model T, would better retain the present price and give more attention to improving some of the points which the purchaser finds necessary to remedy shortly after he buys his car.

Will Some One Answer?

From N. A. Carter, New Albany, Mississippi.—I have a Model O White Steamer that does not keep steam on direct drive unless on good roads and running about 25 miles per hour. Can you tell me how to get the correct lift of the check valve (1-32 of an inch)? Is there any gauge made for this purpose? What would cause the thermostat to work extremely stiff? It will go to extremes before it operates either to open or close. Should the spring on the condenser escape valve have considerable tension on it or not?

Uses Kerosene In an Air-Cooled Car.

From O. C. Vermilya, Fremont, Ohio.—In a recent issue in your Trouble Department you state that the use of kerosene with gasoline will cause a greater amount of carbon to be deposited in the cylinders. I have used a mixture of kerosene and gasoline for several years and beg to advise that the results depend entirely on the ability to perfectly vaporize the mixture. For this reason the engine will usually start harder, and in cold weather should be primed with gasoline. After the engine is warm most modern spray carburetors will vaporize a mixture of two gallons kerosene to five of gasoline with no increase of carbon in water-cooled motors. A majority of air-cooled engines burn up their own carbon except in the exhaust port and pipes. My 1907 Franklin motor does very well on equal parts of gasoline and kerosene in the summer months.

A Home-Made Inner Liner.

From E. Burnaugh, Iowa.—In regard to using casings for tire protectors on the outside, I think it would be considerable trouble and expense to get clamps for the same, but I know from experience that you can by cutting off the bead. In doing this you must be careful and not cut through the casing because if you do it will leave a rough edge that will pinch the inner tube. By just trimming it off from the outside, it leaves the inside just as it was in the first place. Also cut all of the tread off and the breaker strip and then it will fit inside the casing and you will have an inner liner that will beat any you can buy.

Keep Water in Radiators.

From H. H. Rice, Indiana.—I have learned from the foreman of our repair department that it pays to keep radiators full of water when in the repair shop. When radiators become dry the coating inside becomes like powder and drops down, filling up the tubes. Radiators which worked properly before the car was brought in for repairs in many cases heated and gave great trouble after the repairs to the car were made. It took a long time to figure it out, and since that time it has been the practice to keep the radiators full of water while the cars are in the repair shop, and no further trouble has been experienced.

For a Defective Auto Horn.

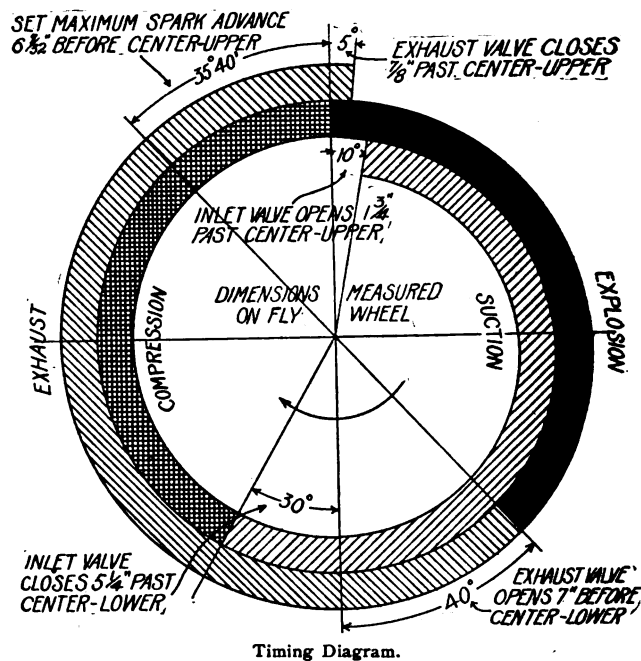
From N. M. Sloan, Florida.—To cure a sick auto horn, strike or file the reed with the flat side of a file until it closes up to the desired former position.

Spark Plug Lengths.

Many spark plug troubles are caused by the fact that the plug is too long, or more usually too short for the cylinder head or cap. In modern accepted practice the plug should extend down in the cylinder head or cap just far enough so that the points or electrodes protrude slightly into the compression chamber. If the plug is too short the electrodes will be "pocketed" and the spark will occur in half dead gas, that is, fresh gas mixed with burned gas. This will cause misfiring or perhaps difficulty in starting. On the other hand, if the plugs protrude too far into the chamber, the electrodes will become too hot; and in some cases will either burn off or become distorted in shape, altering the gap distance. It is a good plan, therefore, to measure carefully the distance through the cylinder head or cap, as the case may be, and get the proper length of plug.

More About Motor Timing.

The motor should be timed accurately, so that the ignition will occur between the interval of inspiration and the interval of the power stroke. The mixture should never be permitted to burn during the power stroke. This stroke should be devoted to expansion work. On the other hand, the ignition should not take place before the completion of the suction stroke. In poorly timed motors the gas being taken in is reduced below the best level and the work that the compressed mixture is capable of doing falls below par because the burning of the gas is prolonged into the power stroke. In dealing with this problem there are four prime considerations: The carburetor must supply a well-balanced mixture; the intake valve must be timed to admit the fullest measure of mixture; the ignition must be energetic and precisely timed so that the gas will be ignited and burned before the begin-



Timing Diagram.

ning of the power stroke; the exhaust valve must be opened at the instant it will permit of the scavenging of the cylinders during the remaining stroke, thus paving the way for the beginning of the succeeding cycle under the most favorable conditions. In dealing briefly with this problem it will suffice to state that the timing of a motor must be varied to suit its characteristic and the speeds of its range of performance. The illustration, shows the timing of the valves and the spark.

The things that happen to automobile tires in races ought to be warning enough to all users that speed is expense. High speed very often defeats its own object because so much time is taken out to replace tires which are used up by the friction.

The difficulty in starting the ordinary four-cycle automobile motor in winter is due primarily to the fact that gasoline at winter temperatures vaporizes very slowly.

If you find an empty grease cup which must be filled and your supply of grease is gone, unscrew one of the front wheel hub caps and borrow enough grease to fill it.

Anti-Freezing Solutions.

The most common three solutions used to keep from freezing the cooling systems of water-cooled automobile engines are calcium chloride, glycerine and alcohol. The alcohol solution is usually preferred because it does not damage the metal of the water jackets, radiator or connections, and has no fault except that it evaporates. The other solutions each have advantages, and users may consult their own preferences as to which they prefer.

In using calcium chloride when compounding an anti-freezing solution, care must be taken that commercially pure salt is employed, as the cruder grades will liberate quite a per cent. of free acid. Galvanized iron tanks and cast aluminum water manifolds and pump casings prohibit the use of this salt as its destructive action is great on such metals. The solutions may be made in these proportions:

Two pounds to the gallon of water will freeze at 18 degrees above zero.

Three pounds to the gallon of water will freeze at 1.5 degrees above zero.

Four pounds to the gallon of water will freeze at 17 degrees below zero.

Five pounds to the gallon of water will freeze at 39 degrees below zero.

It should be remembered that no more of the salt should be used than will answer for the required low temperature.

Glycerine makes a good solution, but it is destructive to rubber hose and should not be used in a car where part of the circulation system piping is of rubber. Glycerine is also expansive and it is liable to decompose if allowed to heat. But it is often used and will answer the purpose of preventing freezing although the proportion of glycerine must be large, say half glycerine and half water for a low temperature.

In using alcohol, 80 per cent. water and 20 per cent. alcohol will freeze at five degrees above zero, and 65 per cent. water and 35 per cent. alcohol will freeze at sixteen degrees below zero.

Plain Round Tread.

"The best all-round tire for ordinary use is the plain round tire," says P. W. Litchfield, factory manager of the Goodyear Tire and Rubber Company, Akron, Ohio, "as it rides the easiest, wears the longest and consumes the least power to drive the vehicle, reducing the fuel bills and increasing the speed. The disadvantage of this tread is that it is apt to slip on certain surfaces, causing loss of traction and skidding. Where these conditions are not it is advisable to introduce a surface on the tire to prevent same. Thousands of designs have been adopted, consisting of various shaped projections of rubber, metal studs, coiled wire springs, indentations in the rubber, etc. The metal studs and coiled wire springs have gradually decreased in popularity, owing to the excessive first cost of the tire, in combination with a much decreased mileage, making the cost per mile prohibitive against the results accomplished by the rubber studs. Therefore we have adopted the projections of rubber for our non-skid tire."

Putting on the Brakes.

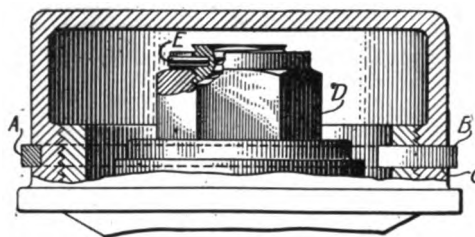
"Putting on the brakes of an automobile is a simple operation and yet only two or three drivers in ten apply brakes properly," says J. W. Maguire of the Republic Rubber Company's Chicago branch. "Stopping

a car without applying enough pressure on the brakes to lock the wheels is the most efficient braking method.

"Brake tests have proved conclusively that locking the wheels is not enough; the brake must do more. When the wheels are locked the tires slide over the surface. A small portion of the tread becomes smooth and the adhesion between the tire and the street surface is reduced. Better results and shorter stops can be made by releasing the wheels when they begin to skid and immediately tightening the brakes again, bringing a new portion of the tread into use. In addition to reducing the efficiency of your brakes the sudden locking of the wheels and holding the tire in a fixed position against the road surface wears away tire treads rapidly and increases the tire expense."

The Hub Caps.

Owing to their insecure fastenings, bolts, nuts and hub caps often get lost off. Hub caps are great offenders in this regard, and designers seem to pay little attention to having them properly and permanently fastened. No one should run his car long after a hub cap has been lost off. If he does he is liable to ruin a set of high priced ball or roller bearings, and possibly have the additional bad luck of having the wheel



To Hold the Hub Cap.

part company with the car. The illustration shows a hub cap that will not stay on merely because it is screwed up on the threaded portion of the hub, and it is suggested that a wire lock A in a groove chased in the hub cap, extending around the circumference with a bend W, through registering holes H, will do the work. Nor is it difficult to make this provision in a given case. The best way to lock on the nut D, is to castellate it as shown, and after drilling a hole through the threaded part of the spindle in the region of the castellations, a cotter pin E may be passed through the hole, engaging the wings of the castellation, after which its ends may be spread so that it cannot back out. A matter of this kind is not a momentous one, but if the hub cap or some bolt or nut falls off, there is no knowing what it may lead to.

A Spark Plug Wrench.

The base or shell of a spark plug is the part that is screwed into the cylinder head or cap, and to facilitate removal or tightening it is provided with a hexagonal shaped head. To prevent the hexagon from becoming scarred and disfigured, a socket spark plug wrench should be used for this purpose. There are many such wrenches now on the market. This sort of wrench will also prevent the porcelain or insulator from becoming damaged from the wrench slipping. The next best thing to a spark plug wrench is a monkey wrench. Never use a pipe wrench, and never attempt to remove a spark plug base from the cylinder or cap when the insulator is removed except with a socket wrench. A monkey or pipe wrench will crush the base and render it absolutely unfit for further service.

Automobile Dealer and Repairer

A Magazine of condensed and compact information for busy readers.

PUBLISHED THE MIDDLE OF EACH MONTH BY

THE MOTOR VEHICLE PUBLISHING CO.

71-73 Murray Street, New York

Telephone, 6765 Barclay

Post Office Box, 654

Entered as second-class matter at the Post Office in New York City.

M. T. RICHARDSON, President and Treasurer.

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TERMS OF SUBSCRIPTION.

One Copy, One Year, Including Postage.....\$1.00
One Copy, Six Months.....60 cents
Single Number.....10 cents
Foreign Subscriptions.....\$1.50, or 6s. 3d.

Remittances should be made by Express Money Order, Draft, Post Office Order, or Registered Letter. Foreign remittances, where possible, by International Money Order.

ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, NOVEMBER, 1912.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

THE WANE OF COMPETITION.

Disguise it as we may, welcome it as we may, deplore it as we may, the time is coming when automobile production will be in few hands. More than is the case of almost anything else in the manufacturing line, automobiles must be made in large quantities to secure the lowest possible cost of production. This is largely due to the great number of parts that go to make a car, the widely varying character of these parts, both as to material and construction, and to the necessity of employing men of widely varying skill in this production and in the assembling.

The automobile of the future will be even more than now the almost exclusive product of the machine rather than of the hand, and in some respects the machine will do work of even greater accuracy and reliability than the average hand.

Some years ago a bicycle called the "Tourist" was made in this city. The price of this wheel was \$150. It was what may be called a strictly hand-made wheel, and was a very good one indeed. If we are not mistaken, the price was finally reduced to \$125. But be this as it may, the enterprise was not successful, and the firm manufacturing it went into bankruptcy. The business was afterwards reorganized, and with new capital a bicycle was produced that sold for \$20 and the enterprise was then successful. The writer of this was told by the head of that firm that not only was there more profit in manufacturing the low-priced wheel in large quantities by machine than in the production of the high-priced wheel by hand, but that in his opinion, the low-priced one was in many respects as good as the high-priced one.

This is an age of machine production and of production in large quantities. It is an age of co-operation and of combination rather than of competition, and all attempts to enforce competition by legal or other methods—legislation having for its purpose the division of great

business combinations into small parts—will be as futile as an attempt would be to enforce a return to the tallow dip or the spinning wheel. Combination and co-operation in business are here to stay.

Some one may ask why we may not now have competition as well as years ago. We will answer: There can be no competition among producers of any article of consumption when the demand for that article is greater than the supply, and when the demand for that article is less than the supply, the competition among producers will be so sharp that sooner or later the weaker producers must either go to the wall or be merged with the stronger ones. In years gone by when competition was the rule, production was always just a little below the demands of consumption, consequently competition was then healthy and never need bring prices down to the cost of production. Today it will invariably bring prices quickly below the cost of production and consequently is ruinous to business and cannot thus be enforced either by legal or other means. Self-preservation is the law of nature as well in the business as in the physical world.

HOW SHALL IT BE DONE?

The reckless automobile driver still roams up and down the land. If he did but put his own life alone in jeopardy, there might not be an occasion for so much regret or a necessity for warning others. In due season he would be removed by the fulfilment of the great law of chance, and quite likely the recruits would be insufficient to keep full his depleted ranks.

But it is unfortunate that he is a menace to the worthy and the useful—to those whom the world or society can ill afford to lose. Thus it is that we must often warn our readers to be on the lookout for him. He can usually be detected afar off, so to speak. He bears down upon you as if he had been shot out of a gun. The only safe way is to give him the whole road. It is true, you may be able to pass him without a collision and still keep the left hand wheels of your car on the edge of the road, but this is a dangerous practice. The better way is to take no chances.

Possibly some of our readers have a suggestion to make as to how best to remove this highway menace. If so, we would be glad to hear from them. In districts outlying the large cities he is especially pernicious. Sooner or later he must be removed and the highways made safe for decent and law-abiding citizens. Will some one tell us how best to accomplish it?

NONE TOO MUCH.

Thirteen well-known automobile manufacturers have recently made a most vigorous protest against the proposal to reduce the tariff on imported automobiles from 45 to 40 per cent. This protest has taken the form of a closely set advertisement of nine columns which has been run in several of the leading newspapers of the country.

The following are the committee representing these manufacturers: Charles Clifton, treasurer of the Pierce-Arrow Motor Car Company, of Buffalo, N. Y.; Henry B. Joy, president of the Packard Motor Car Company, of Detroit, Mich., and W. C. Leland, vice-president and general manager of the Cadillac Motor Car Company, of Detroit.

It will be noted that the above named gentlemen are all manufacturers of high-priced cars. Those who make automobiles for \$1,000 or less need not at present have much fear of European competition whether the import duty is 45 or 25 per cent. They manufacture in large quantities and their cars are as a rule machine made,

otherwise they could not begin to sell their product at such a low figure.

Very little attention has thus far been given abroad to the construction of low-priced and machine-made cars. The reason for this is that, as a rule, in Europe a man can either afford a high-priced car or he can afford none. And in relation to hand or machine work, the greater the labor cost the greater the tendency of displacing it by machinery, and the less the labor cost the less the reason to put in labor-saving machinery.

But we want to say right here, that if in England or Germany or France, a condition should develop whereby a market could be found for a large number of low-priced cars, the adoption of machine production would so reduce manufacturing cost there that 45 per cent. duty would be none too much to prevent an invasion into this country of foreign made cars at a low price.

BETTER THAN PNEUMATIC TIRES.

We have said repeatedly that no substitute will ever be found for the pneumatic tire, and have given the reason for it, which is that there is nothing so light, so cheap and so durable as air.

But the pneumatic tire may sooner or later be displaced because there will no longer be a need for it any more than there is a need for pneumatic tires on railway trains. With highways as smooth as concrete, pneumatic tires or even rubber tires, are a detriment rather than an advantage. The writer learned this by an experience of a good many years on the bicycle. Any bicycle rider of an observing nature cannot fail to note that on smooth concrete, hard tires, and for that matter, tires of iron or steel, can be pushed easier than pneumatic tires or even than tires of hard rubber.

When it is considered that smooth highways would allow the use of automobiles of not more than half their present weight and of half their present strength, and that the cost of propulsion might be reduced one-half, it will be seen that they are something of the utmost importance, and in the long run will surely prevail.

THE SKIDDING TRUCK.

Those of an inventive turn of mind would supply a real need by devising an anti-skidding chain or other protection for the solid tires of commercial cars. There is a tremendous sale of anti-skidding protectors of pneumatic tires, but as far as we know there is no tire chain on the market that quite fills the requirements of the heavy solid tires of the large automobile trucks.

Those who have investigated the matter find that an attachment for the purpose—something that can be put on and taken off easily and that will not destroy the tire, the street or the car—is difficult to devise.

There is a possibility that commercial truck wheels may be somewhat increased in size to mitigate the skidding tendency. At all events, there is trouble with skidding automobile trucks as well as with ordinary pleasure vehicles, although the remedy for the skidding truck is far more difficult to find.

THE COMMERCIAL CAR.

Although the pleasure car will probably never quite displace the horse, the commercial car and the horseless truck are likely to soon entirely sweep the work horse from city and town streets.

Four years ago there were comparatively few manufacturers of commercial cars, but today they exceed in number the manufacturers of pleasure cars. Of course there are more pleasure cars being sold than there are commercial cars, just as there are more pleasure horse-

drawn vehicles being disposed of than business wagons, but the final revolution of vehicle traffic will be more complete in respect to commercial than to pleasure automobiles.

When the horse is finally driven from city and town streets, there will be an improvement in public health, and comfort and it will cost far less to keep the streets clean.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Although the accidents reported this month seem to be quite up to the average in number, the fatalities were less than usual. At this season when the streets and highways are likely to be wet and slippery, there is danger from skidding and a good many accidents reported this month were from this cause. But skidding accidents need never occur if the driver will use ordinary care and not run the car at too high speed.

Speaking of accident and of careless driving, it is worth mentioning that Detroit, Mich., has not only an unusually large number of automobiles but it is the home of some of the most influential manufacturers in the country. When to this is added the fact that the surprising growth of Detroit is due to the automobile, it will be seen that there is no reason why there should be undue prejudice for the car or for anything that is likely to curtail its use and enjoyment. But in that city every operator of an automobile has to come to a dead stop when approaching a cross street and give the direction they want to go to the street crossing officer before they are allowed to cross. Furthermore, it is a misdemeanor for any operator of an automobile to pass a street car which has stopped at a crossing to take on or let off passengers without first coming to a dead stop, and should he fail to comply with this ordinance and an accident occur, he is severely dealt with. Remember this is in a city noted for its large business and it does not seem to work any hardship on the owner of automobiles. Until some such laws are had in all large cities we shall have constant repetition of these sad accidents.

Killed by a Train.—A man was instantly killed by a railroad train near Columbus, Neb., when he attempted to drive across the tracks at the station. Another train was standing at the depot, and he did not see the fast train which was approaching.

An Automobile Collision.—A big touring car and an equally large pleasure car came together at right angles on the streets of New York and with such force that the occupants of both were all thrown out and six of them very seriously injured. Both cars caught fire and were destroyed. The accident abruptly terminated a joy ride of two laughing and singing Hal-lowe'en parties.

Crashed Into a Tree.—Near Jacksonville, Fla., a man attempted to cross a bridge at a high rate of speed, and as he did so a bolt fell from the steering apparatus of his car. Losing control of the machine, it skidded and crashed into a tree with terrific force. The car was pretty well demolished and the occupant had a narrow escape from death.

Result of Striking a Rock.—Near San Diego, Cal., the automobile in which five people were riding struck a rock and overturned, throwing out all the passengers and injuring some of them, it is feared, fatally.

The car was coming at a rapid rate of speed and probably would not have overturned if it had not struck the rock with a sidewise glance, when it skidded.

Another Skidding Accident.—Four persons were injured, two seriously, and two others had narrow escapes, when a car skidded and capsized in a ditch near West Toledo, O. The car was, as usual, being driven at a high rate of speed, and in rounding a curve it in some way got beyond the control of the driver and quickly turned over into the ditch.

Result of a Leaky Water Pipe.—A man and his wife were on their way to Maurice, Iowa, when the car ran into a small mud hole, which was caused by a leaking water pipe running from a supply tank. He turned aside to pass the wet spot, but the car skidded and rolled down the embankment. The man was killed but his wife fortunately escaped with a few bruises.

Killed a Policeman.—In Central Park, New York, a policeman was run over late at night by a rapidly driven car. He was almost instantly killed and the car was driven away with no investigation as to the result of the collision on the part of the driver. After an all day search of garages by several hundred policemen, four arrests were made, and it is thought that the guilty parties were found. This is the second policeman to be run down in Central Park by careless automobile drivers. The officer was patrolling his beat and was on the sidewalk, but the car swung along the curve and skidded from the road before he could get out of the way.

AUTOMOBILES IN RUSSIA.

Why They Want American Cars and Why They Do Not Buy Them.

From Vice-Consul F. W. Cauldwell, Batum, Russia. —The letter from which the extracts given below are taken is quoted solely with the idea that American manufacturers of automobiles will find a value in knowing how their selling arrangements for Russia work under actual experience. Its writer is an American and the chief officer in Batum of a concern that has purchased hundred of thousands of dollars' worth of American machinery.

He has just ordered from America a light-weight automobile, but before making his choice asked various firms in the United States for prices on cars advertised here at \$625 to \$1,600. He says that in most cases he was referred to agents in Russia, or elsewhere in Europe, and that prices charged by these agents were \$75 to \$417 in excess of the advertised price in America plus all transportation charges and duty. He has finally had friends buy a car in the United States and ship it to him at Batum.

A good market should be found in the Caucasus for lightweight low-priced American automobiles. The American car is peculiarly suited to road conditions here, which are practically the same as in the United States. Purchasers have found the cars of European manufacture too heavy and swung too low and are turning their attention to the American product. Within the past few weeks two or three American runabouts have been brought in and have attracted wide and favorable interest. There is every reason why the American car will have a preference if advantageously priced.

Advertised American Prices Known in Russia.

It should be noted that American magazines and papers in which automobiles are advertised with prices

annexed are already in the possession of enthusiasts here. If the prices which the foreign agents quote for the cars are greatly in excess of the advertised prices in the United States, plus the known transportation charges and duty, the fact is quickly noted. The letter referred to is dated May 7, 1912, and reads:

Referring to our various conversations in regard to the possibilities of extending American trade in this part of the Russian Caucasus, let me relate my experience in attempting to buy an American automobile.

For the past six months I have sought information of and written to various automobile companies which advertise in the well-known weekly and monthly American periodicals. Among others, I have written the Elmore, Hudson, Flanders, Reo, Maxwell, R. C. H. Buick, Hupmobile, Overland and Ford people. One of these firms replied that it had no cars for export and that my inquiries would be answered and a catalogue sent by an exporting connection in New York. I have yet, after some months, to receive these. Two other firms, though I have written them twice, have never sent me their catalogues. I finally wrote their English agencies, and in this way secured the information I wanted.

Another firm, very prominent in the Glidden tour last year, when quoting the price of a certain type car, told me I could have it shipped direct from New York, gave the cost of packing, etc., f. o. b. New York, and stated that my letter had been sent to its London agent, who would reply to my inquiries in regard to certain mechanical features. Eventually the London representatives wrote me they had referred my letter to their agent in Russia, who finally partly replied to my letter, but in French. I then discovered that I was supposed to pay, not the American advertised price plus cost of getting it here, as I inferred from the manufacturer's letter would be the case, but approximately \$150 more for the 2-cylinder runabout this firm sells for \$625 than I could have bought the same car for from an agent in the United States, had it packed, paid ocean freight and duty and landing charges, and thus got it here myself.

The other vehicles about which I sought information have been touring cars, ranging from \$690 to \$1,600, and in one instance a 15-hundred weight capacity delivery wagon, intending to try one of the latter and if satisfactory to purchase two more for the company's use. In but three cases did I receive the courtesy of a direct reply to my inquiries. One or two concerns informed me that my letter had been referred to their London or Paris agency; but generally I did not receive their American catalogues which I wanted, and the first acknowledgement of my letter would be from European agents with pamphlets containing the brief specifications given in the American advertisements, with the added statement that any further information required would be furnished by some "Mr. Ivan Ivanovich" or other, in Odessa, Moscow, or St. Petersburg, and from whom, in some instances, I have received letters replying in French or Russian to my inquiries put in English and sent to America. From others I have yet to hear.

Can Not Buy a Car Direct.

Briefly, I find that, with the exception of one firm from which I have not yet had time to get its London prices, I can not buy a car of any of these makes by writing to America; that in 70 per cent. of the cases I can not get the courtesy of a direct reply to my letters written in English; and that I am supposed to pay, without any exception other than the one just referred to \$75 to \$417 more than the same cars are

sold for by agents in New York, allowing all costs of crating, freight, duty, etc.

Most striking is the case of one firm which sells a touring car for \$690 at its agencies in the United States and for \$1,337 in St. Petersburg. It cost \$25 to crate this car, approximately \$75 for ocean freight either to St. Petersburg or Batum, and \$110 for duty, with, say, \$10 landing charges and \$10 for insurance, bringing the total to approximately \$920. I wrote this firm in America for full information, asking them to send me descriptive literature. I eventually got two catalogues and a letter which I consigned to the waste paper basket on seeing I was supposed, if I purchased this car, to pay \$417 in excess of its cost in America. The cars priced \$1,000 to \$1,500 will, in the same manner, cost anywhere from \$75 to \$200 more than I could get them for by paying all expenses myself, if I were permitted to purchase direct in the United States.

Far different has been my experience with British manufacturers or London agents of French, Belgian, German and Italian cars. In 12 different inquiries on cars costing \$1,750 to \$4,000 I have in all cases received the fullest information.

Offer of an English Manufacturer.

As a contrast to the apparent arrangements made by American manufacturers for the sale of their product abroad it is interesting to note that the makers of one of the best English cars offered a friend in Batum the agency of their cars for the Caucasus. It was my privilege to read this letter, and the friend was offered a per cent. reduction on the advertised and catalogue price of their cars as his commission on each car sold; but this per cent. reduction was not to apply to any car sold in the district to a customer who bought his car direct in England independently of the agent. In other words, if I wanted this car I could buy it either direct from England or from the Batum agent. In either case, whether I bought it here from the agent or whether I purchased it in England and paid the charges of getting the car out myself, the price of the car would be the same to me.

Although knowing I wanted the car purely for private use and that I was in no way interested in the sale of automobiles, four European firms offered me the car I inquired about at a reduction of 12½ to 17 per cent. simply to have one of their cars represented and running in this section.

American cars, particularly in Russia, should have a splendid field. The British cars are built for the superb English highways and are too low, too heavy, and have too little road clearance—seldom 8 inches—for the Russian roads. There are few firms that make what they call a "colonial" model with 9½ to 13 inch road clearance, but these cost about \$2,750 in England, and with the superb coach work on their bodies are more expensive and luxurious than the masses in Russia can afford, or would appreciate to the extent of being willing to pay the difference in cost between an English and an American body.

American Cars Have Every Advantage.

The French and German cars have more road clearance than the usual British car, but are also too expensive to enjoy widespread use and popularity here in Russia.

An American car, however, that sells for \$1,000 to \$1,250 for a 4-seater is, in road clearance, in weight, in price, and in finish, just what is required here to enjoy wide popularity and meet the pocketbooks of thousands who can not afford a British, French, German

or Italian car—if they can be sold in Russia for what American agents sell them plus cost of freight, crating and duty.

FIXING UP AN OLD CAR.

Some Things May Easily Be Done to Improve Its Appearance.

Much can be done to improve the appearance of quite an old car, and to render its engine more efficient at a small expense, by the owner himself—for a man who runs such an old machine is usually something of a mechanic and a handy man with tools, of which he generally has a good assortment.

The first, least expensive, and most effective improvement to an old car is fitting running boards. The local blacksmith will probably be equal to any small alterations to existing step-irons, or to the making of one or two new ones if necessary. A stout packing case would furnish the boards, which must be planed up and snugly fitted, and American cloth serves for the valances, tacked beneath the running boards at the back, and tucked between frame and body at the top, or tacked to the body in the neatest manner that suggests itself. The running boards may be covered with a dark linoleum to suit the color of the car, and a brass bead may be run along the edge. The cost of these improvements will probably not exceed \$2 for material, etc. Valances may also be fitted between the wings and frame. These, while not adding very much to the appearance, will help to keep the body and bonnet from being splashed in muddy weather; and one of the points of a modern car is its comparatively clean state after a muddy run. The best way to fit the cloth to the wing is by turning it twice round a strip of tin about ¾ inch wide and fixing tin and cloth to the wing with small screws and nuts every few inches. Screws and nuts for this may be bought at any hardware dealers. They are plated, and do not look unsightly. The lower part of the valance can be secured to the body or bonnet plate with tin tacks; and the underside of the cloth should be enamelled or painted to suit the color of the wings.

With regard to the body itself, much depends on the individual case. The average amateur is not equal to extensive alterations, such as converting a back entrance to a side entrance, but whatever is, or is not, done, all body noises and rattles should be as far as possible eliminated. Doors that rattle may have little pieces of rubber tacked in the frames so that they bed in tightly, and in a landaulet body many other places may be found requiring similar treatment.

If the owner be skillful with a paint brush, and ambitious, he may paint and varnish the whole car. If properly carried out it is a long and tedious job, particularly if the old paint be much chipped, as this means a great deal of time "stopping" and "rubbing down," and even briefly to describe it would take a whole article. With care and patience, however, very fair results may be obtained, the great obstacle usually being dust in the last color coats and varnish. A coat of enamel is rather less trouble, and will look well enough if the original paint is not badly chipped. If a new color be desired a couple of coats of paint should be applied before the enamel, allowing each to dry thoroughly, and rubbing down with powered pumice after each coat. A good light is essential, and dust should be kept down as much as possible by sprinkling the floor with water; and if the roof lets in dust a

damped sheet may be suspended over the car, about six feet above the floor.

If no painting is to be done, all the body and paint work should be thoroughly cleaned with kerosene and polished. The best way is to clean a portion at a time with a rag well wetted with kerosene, polishing with a clean rag, taking a fresh piece as soon as the one in use becomes soiled, and continuing this process until no more dirt comes off. The pressure on the rag should not be heavy, and should grow lighter as the work proceeds. When the whole is finished, it may be left for a day, lightly polished with a clean rag to remove any last trace of kerosene, and treated with linseed oil or furniture polish. The methods are equally good, but the linseed oil appears to feed the varnish and prevent the spreading of minute cracks. The oil should be lightly and freely applied, left to dry in for a few hours, and then polished off with clean rag. In a few days' time a second dressing of oil may be given and after another week a final gloss with furniture polish.

The upholstery may be cleaned in the same manner as the paint work—kerosene first, and olive oil in place of linseed, finishing with furniture or boot polish. Both the olive oil and the polish may be used plentifully on chafed and worn places, and if the upholstery be really good—as is often the case on old cars—this treatment will freshen it up surprisingly.

As a good deal of the noise of an old car usually comes from small loose parts banging and rattling, it will be advisable when fitting to see that all shakes and rattles in control rods, brake operating mechanism, and the like are taken up where possible. The cylinders may be painted with some of the preparations sold for this purpose, but preferably not with aluminum paint. The piping for induction, water, oil, and cables must be carefully polished in detail, and the frame and all parts seen when the bonnet or floorboards are raised should be cleaned, and painted where necessary, for if the car is to be touched up outside these parts must correspond, or the general result is bound to be unsatisfactory.

It is, perhaps, scarcely practicable within the limits of a short article to furnish general advice of any value with regard to the muffling of an old car. With body noises and rattles eliminated, the chief causes, speaking broadly, that remain will probably be engine, transmission and exhaust. To deal with the last first, many old silencers are, as such, very inefficient, and the fitting of a modern muffler involves no great outlay, and the effect will generally be satisfactory. A discriminating ear will perceive where the trouble lies in any particular case, and it is then simple to say what improvements, if any, can be carried out. Noisy tap-pets may be fitted with fiber pads, and—a small item, but sometimes important—the timing gear covers on old cars are not always really grease tight. If they can be made so, and are kept well supplied with a suitable grease, another step toward silencing will frequently have been made. Where small chains are concerned, for pumps or distributor drives, cases can often be fitted with success. With chain-driven cars, chain cases are somewhat beyond the amateur's power to make—nor is there always room to fit them—but chains, if in line and properly cared for, are not so very noisy. The noisiness of chain-driven cars is usually judged from the worst examples one meets, but with shaft-driven cars the reverse is the case.

Coming now to the last, and perhaps most important, point—increasing the power. It is quite infrequent to find the apparatus for ignition incapable

of adequately performing its functions, if it be thoroughly cleaned and put in order. The trouble with many old cars may be summed up in one word—carburation. Piping may be simplified, sometimes with advantage; it is not often that valve lifts can be increased or ports or pipes made larger. Nor, if these things be done, is the consequent gain always sufficient to be worth the outlay. Increasing the compression by means of a plate bolted on the top of the piston is a doubtful benefit in many cases. But in almost every case a distinct improvement follows the fitting of a modern carburetor, and the control of the engine is thereby made more simple and pleasant to operate. The actual power of the engine may not be increased, though usually it seems to be; but it can be employed to better advantage, and there is an increased regularity and evenness of running which again make for quietness and comfort in driving.

LIGHTING THE CAR.

Merits of Gasoline, Acetylene and Electricity and Things to Avoid.

Owing to the present lack of standardization in motor car manufacture, many accessories are not of general application, and special fittings have to be made which the beginner does not want to be troubled about. Before long all, or nearly all, firms will probably find it to their advantage to supply their cars complete with all accessories, even if they are not placed under the necessity of doing so.

The accessories which are more commonly supplied are lamps, horn and tool equipment. Individual tastes with regard to lamps may vary considerably. If the car is not to be often used at night, kerosene side lamps alone are all that are necessary in case a short journey after dark has to be made. Many motorists have a rooted objection to driving after dark. However, one sometimes is compelled to drive after dark, when paying visits, etc., so lamps of some kind must be carried.

If a brighter light than that from kerosene side lamps be desired, small acetylene lamps can be carried in their place.

If night driving is to be frequently indulged in on country roads head lamps of some kind are essential. Most usually acetylene lamps are employed, these comprising the lamps proper and a generator supplying the acetylene gas to the burners. The generators may be combined with the lamps, in which case the latter are termed "self-contained." Or the generator may be separate, the gas reaching the lamps through flexible connecting tubing. In the former case, if two head lamps be used, the systems are duplicated. Self-contained lamps are very heavy, and being somewhat exposed, bear the brunt of collisions, if any. If the generator be separate from the lamps, trouble may arise from leakage and breakage of the connecting tubing. Separate head lamps are light and comparatively inexpensive, and if they are damaged the cost of repair is small. Most motorists recommend the separate generator system, though there are self-contained head lamps which seem to be satisfactory.

Electric lighting is now becoming very popular. A late and approved system consists of a small battery of accumulators, a dynamo driven off some part of the engine, a switchboard on the dashboard, together with head, side, tail and other lamps. With the switchboard one can, from the seat and without stopping, switch on any of the lamps, or cause the dynamo to

charge the accumulators. Undoubtedly this system is luxurious. It is expensive, and should anything go wrong the trouble is often outside the capabilities of those at hand to remedy. In most cases, however, the lamps can be lit either from the dynamo or the accumulators, so that one has the latter to fall back upon. The system involves a considerable amount of electric wiring, which, unless metal-covered, does not stand well on a motor car. If first cost be of no great moment, and if the best is to be obtained, electric lighting is the system to adopt.

Lamps can be obtained either in brass, nickel, or black finish. The latter is generally a dead black surface, which requires no polishing but merely wiping or washing. The beginner, if looking after the car himself, is strongly advised not to have bright metal parts if they can be avoided. If bright lamps be used, they can be fitted with waterproof covers in bad weather, these being supplied by accessory makers, or the lamps can be removed and carried in the toolbox (if this be large enough). In any case it is advisable to carry the tail lamp inside the car somewhere until it is wanted. The ultimate fate of a tail lamp is to fall off and get run over, a fate which the above practice postpones. A tail lamp must illuminate the rear number plate, unless other means for its illumination are provided.

Under Inflation Injury.

"Why will car owners persist in neglecting their tires, when the exercise of a little care would save them many dollars a year?" asks B. J. Cox, chief adjuster of the Goodyear Company, of Akron, Ohio. "The tire is one of the most important features of an automobile. It is built for service. The service will not be forthcoming if the tires are not treated with a reasonable amount of consideration.

"The men who get their money's worth and more out of their tires are those who detect an incipient trouble and proceed to remedy it at once. The greatest source of tire trouble is underinflation. A motorist will run his car for miles on tires that are not properly inflated—perhaps for the reason that they ride somewhat easier—and then wonder why they fail to meet the guarantee.

"The Goodyear Company, in an endeavor to give its patrons complete satisfaction from its tires, is trying to educate the users to care for them in a manner that will bring long life and reduce repair bills to a minimum. The one who would follow these instructions should begin by supplying himself with a reliable air gauge, and then use it to keep his tires inflated at the prescribed pressure—twenty pounds per inch of the cross-section. For instance, if a tire is four inches, the pressure of air should be eighty pounds.

"Another thing the man who wants to save expenses should bear in mind is the fact that 5 per cent. added to the weight of a car usually subtracts 15 per cent. from the life of the tires. As long as the car owner packs eight or nine persons in his seven-passenger machine he must accept the consequences.

"In order to get all the pleasure there is to be had from automobiling, and also to save expenses in the long run, the owner should find out the weight of his car and then equip it with tires of ample size. The small added cost at the beginning will bring him interest in the form of utmost service, mileage and entire satisfaction.

"There are still other motorists who experience trouble with their treads wearing out. Undoubtedly

they can be numbered among those men who bring their cars to a standstill so suddenly that it would really be a miracle if the tread didn't wear off long before its allotted time. A car should never be brought to a standstill within its own length unless circumstances call for it. Slow up gradually.

"Avoid car tracks and ruts. Don't try to speed over rough roads. Examine your tires often for cuts and stone bruises; fix them up with a little quick repair gum and you will find them giving twice the mileage they would have given if neglected. Be sure your brakes are properly adjusted; if not, they throw all the strain of stopping on one tire, and this, as every one knows, means ruin. If the man who is anxious to save tire bills will follow these few suggestions he will soon find expenses cut and will get more pleasure out of motoring."

A Substitute for Gasoline.

Over in England they are discussing the use of "benzole"—benzine, probably—in place of gasoline. It appears that it requires no alteration of the carburetor, at the same time it is essential that extra air should be supplied, otherwise complete combustion will not be obtained, and then benzole, or benzine, will be unsatisfactory. All that is necessary is to fit an air inlet in the induction pipe, so that when benzole is used the extra supply of air can be given.

The lever for the extra air inlet is conveniently placed upon the steering column. When using benzole the air inlet is opened as much as possible, when one reverts to gasoline one simply closes it, and so long as the carburetor is right for gasoline it will be equally right for benzole provided the extra air be given. Not only so, there is an additional advantage in the air inlet, inasmuch as it enables one completely to close the throttle downhill and to leave the air full open so that the engine is sucking air instead of gasoline vapor. This in itself tends towards economy of fuel, but there is also the real advantage that the engine is kept cleaner. The reason it is kept cleaner is because in the ordinary way, when going down a hill, one has to open the throttle a little to keep the engine from sucking against it and creating a vacuum in its cylinders, the objection to this partial vacuum being that as the throttle is closed, or nearly closed, the oil is sucked past the pistons and the engine quickly dirtied. On the other hand, with the air inlet open the cylinders are filled with air from the top, and consequently there is no tendency to suck oil up, so that, quite apart from fuel economy, any easily controlled device for providing extra air above the throttle, has the same advantages.

It is, perhaps, well to add that benzole has no deleterious effect on the cylinders and pistons, provided it is properly refined, and, luckily for motorists, the benzole used in gasworks must be refined, as the more thoroughly refined it is the better are the results obtained in gas manufacture. If poorly refined benzole is used which has been insufficiently cleaned and washed there is a risk of some corrosion, inasmuch as traces of sulphuric acid are left in the benzole, but this only occurs when it has been carelessly manufactured.

The use of high test gasoline in winter will do much to make starting easy if one cares to pay the price. It is in effect the same thing as raising the temperature several degrees, as it volatilizes at a much lower temperature than the standard grades.

A New Six at a Very Low Price.

Every one who has seen the new six cylinder McIntyre car is highly enthusiastic. It was put on to the road recently for a long hard drive preliminary to final assembling for the big test. It proved up perfect in every respect. Not a blemish or weakness developed. It turned up over sixty miles per hour with ease, holds the road straight as an arrow; almost guides itself, the weight distribution, balance and riding quality show up perfect. In photographing top and bottom, the chassis was turned over on the side and was found to balance on the hubs showing that center of gravity is slightly below the hubs. This is one of the underslung strong features.

The following are its more important specifications:

Six cylinder, 40 horse power.

Four speeds forward and one reverse.

Unit power plant.

Three point suspension.

All steel chassis construction.

All moving parts housed dust proof.

The wheels and fan are the only visible moving parts.

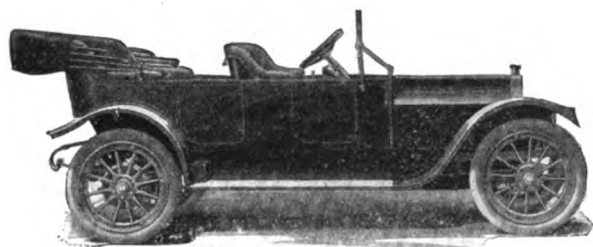
Central single lever control.

Self-starter.

Wheel base 115 inch.

Clearance at lowest point 11½ inch.

Full and complete equipment in every sense of the word.



McIntyre 6 Cylinder, 40 Horse Power Car.

Mohair top with dust hood.

Nickle folding windshield.

Electric signal.

Demountable rims.

Gas tank.

Speedometer with trip attachment.

Handsome eight-day clock dash.

Tie rods between front clamps perforated to carry licensed tags, flags, pennants and other emblems.

Latest improved tire pump.

Substantial wheel jack.

Complete tire repair kit.

Tool bag containing ten well selected emergency tools.

Dust cover for entire car.

Handsome straight line, fore door, five passenger body.

Beautiful finish in rich deep blue with mahogany railings, dash and filler boards.

Eighteen treatments of painting.

Inside door latches.

Center control, new and modern.

Up-to-date invisible coil with lock switch.

Luxurious, soft grain, leather upholstering stuffed with finest curled hair.

Price for all, \$1485.

The car is manufactured by the well-known vehicle firm, W. H. McIntyre Co., Auburn, Ind.

Ford Car Information.

From F. R. Marrs, North Dakota.—It has been a long time since I have butted into your Trouble Department, but I cannot keep still any longer. There are so many things that seem to me wrong, that I wish to add my small quota to the other good wishes of readers. Replying to your No. 1001, on page 48, of the current issue, I see that you say the manufacturers of the car do not advise filing off the small dipper cup and spoons to be found on the old 1910 Ford cars. Now, I am enclosing you a letter from these manufacturers and you can see that they advise doing this very thing. I also have another letter from one of their branch agencies and they advised this same thing. Now, I filed these off, and in fact, did the same thing on two different cars, and since that time have had no trouble with oil in any manner. I use about one quart to the hundred miles. Sometimes I get as much as one hundred and twenty miles, but average just about a hundred miles to the quart.

Now, I have thought for some time that I should answer the kicks made by "Willie Grouch" but did not seem to think of anything strong enough for him. I have finally decided to let him off easy, and therefore, will offer the following for him and other deluded owners of the best car on earth for the price. The fact is, that while these cars have always set the pace for a cheap or moderate priced car, they have shown many good points and have stood up under the most harrowing strains of rough usage and have, in a large measure, made good. Show me a car at any price that has not in some instances fallen down in some particular point and I will show you a car that does not exist. I have now a new Model T Ford touring car, and this is the third one I have owned and used in the past two years. I bought this car shortly before the last drop of \$90 in price and suppose I should be kicking that I had to pay this difference. However, I am not, for I have had more than \$90 worth of use from this car, and still it is for all purposes as good as one that will be sold early this year. The light weight of the Ford, together with the small expense for tires and other parts, their easy handling features and simplicity of construction, makes them a logical car for the ordinary driver, and more especially is this true when the owner does not know a spark plug when he sees one.

If every owner will see to it that his rear axles are kept tight on their seats, that they have proper felt washers, and if he uses the proper kind and amount of grease, he will have no trouble with the grease nuisance. The tapered rear axle is a good feature and you will find nothing better. Take into consideration the amount of Ford cars that are sold (I have No. 142,501), and you can readily see the Ford car is being sold all over the world.

Keep the parts of the car well oiled, keep everything tightened up, leave the original equipment alone, see to it that you do not carry more load than the weight of the car itself, and drive with some degree of caution and judgment, and use common care in the turning of corners and in bad places, and you will have a car that will run as smoothly and handle as well and give as good all round satisfaction as any car built regardless of price. I am always very glad to get my Dealer and Repairer and take special interest in the Trouble Department. If I have been the means of giving any one even one good idea, I am more than satisfied as we should all be willing to help when the occasion presents itself.

(Note.—The facts Mr. Marrs states are correct, al-

though we have had contrary advice from others who are also authorities concerning Ford cars, the statement having been that the Ford manufacturers never advise the slightest change in their cars to alter their original construction. The general opinion is that for any fault in the lubrication, change the lubricant and not the car.)

Substitute for Gasoline.

From G. G. Griffith, California.—In reading your journal for the last six months, I have expected to see some article in regard to distillate as fuel in place of gasoline, and hoping this will lead some other autoist to write his experience, I will give the experience I have had. When I bought my two-cylinder Reo in 1909, the man who taught me to run it recommended distillate, as he had used it for two years or more, with good results and more mileage per gallon, and distillate is generally one-half the cost of gasoline.

However, the first year I ran my car on gasoline, and living in a part of the country that is sandy and hilly, I cannot do as well as others. I cannot say just what I did average on a gallon of gasoline but from a partial account for six months, if I made ten miles on a gallon of gasoline, I traveled farther than I have ever given the car credit for, and I can say for a certainty that I did not do any better than that, and eight miles seems about right, which is a poor showing I must admit.

By buying our gasoline 50 gallons at a time we got it for 20 cents a gallon. Then the garage raised the price to 25 cents a gallon. Then we had an auxiliary tank (2 gallons) put in with stop cocks for both distillate and gasoline, so that I could start on gasoline and then change to distillate as soon as the engine started. I found, as I was told, that it was necessary to close down on the needle valve so as to use less fuel than the adjustment for gasoline. On the first 54 gallons of distillate I made just 15 miles to the gallon, which is the only account I have kept, and as I paid only 7½ cents per gallon, our fuel expense seems pretty cheap, and in every way the machine worked as well or better. Now, after two years using distillate, I would as soon have distillate as gasoline at the same price. I did have some trouble with starting which anyone can avoid. At night when I ran the car into the garage, I would shut off the distillate and run the engine until it would miss and stop, when I concluded that the carburetor was empty, which I now believe was not so. In starting I would open the gasoline and flood the carburetor but believe enough distillate was left in to make only a part mixture of gasoline and distillate, so my starting was never so easy as it had been before we commenced to use distillate. A few months ago I tried a high-grade gasoline with somewhat better results, and now on the last lot of high-grade gasoline, I not only run the distillate out at night, but for a short time I let it run on gasoline, and now my trouble is ended.

The Reo having two cylinders of large bore and stroke, I supposed that it would not do in the average four-cylinder engine. However, last year I bought a Liberty Brush and running out of gasoline, I loaded it up with the poorest distillate we have ever had, with many doubts. With a priming of gasoline I succeeded in making a trip on high gear, I never made but once before and then the roads were in better shape, and it ran just as fast.

I used distillate until I sold the car a week or two later, but it sometimes would need as many as three primings in the pet cock on the cylinder before it would run without stopping. I wonder who cannot afford an

automobile and upkeep when one can get 25 miles, or more, from a gallon of distillate in a Brush with all other expenses low. If it won't double discount a horse and buggy for cheap running I will treat. We have both, as living on a ranch we can use a horse for other work. I can now buy distillate for 10 cents a gallon from an oil company where I have to pay 23 cents for gasoline, though one can buy a drum of gasoline for 19 cents a gallon.

Now if anyone wishes to put in an auxiliary tank, put both stop cocks as near the carburetor as possible so not to waste so much fuel in emptying the pipes, and in stopping for a long stop not only run out the distillate but also run some on gasoline and be sure that your two stop cocks are not both open at the same time, or the distillate may go back into the gasoline tank. I had two quarts of gasoline last me for six months and at the end my tank was fuller than at the beginning, but how many quarts of sweat I lost I would hate to say, for the reason that I did not know that my gasoline tank was being filled out of the distillate tank by the stop cock falling open when I was running on distillate. I think there is a 3 way cock on the market which would be the best arrangement to use. As to carbon, I cannot say. We have never ground a valve in one cylinder and it seems as good as ever. I took off one and ground the valves on general principles but could not get off the oil pipe of the other, so left it alone. One cylinder had some carbon but not much in it. One may need to drain the carburetor oftener than from the use of gasoline. So if any one wishes to cut his fuel bills in half here is a chance with an outlay for extra tank and a few seconds perhaps in waiting to run out fuel.

How it would work in small engines such as a Ford I cannot say but they do not feel the cost as the users of larger engines do. I know of several others who feel as I do after using it, and of no one who has tried it and quit.

For the Careless.

From Emerson Supply Company, Porto Rico.—In cleaning an automobile tank we took out 5½ ounces of solder globules, one of which was just right to act as a "check," but would move with a wire. Yet it would again jar to a check position with the vibration of the car.

Strain your gasoline!

The cylinders had been taken off by some "experts" in seeking the cause of the non flow of gasoline. They may as well have removed the hind axle. These globules we find handy when we have small soldering jobs, but surely they cost somebody more than they are worth.

Porcelains for Spark Plugs.

As nearly all manufacturers of porcelain spark plugs furnish extra porcelains for their product, it is not always necessary to buy a new plug simply because the core of the old one has become useless. There is, however, a right and wrong way of introducing the new porcelain into the old base. When removing the bushing that holds the core in place, the simplest method is to hold the base or shell of the plug in a vise, then a wrench should be adjusted to fit perfectly the hexagon sides of the bushing. If this is done no damage will be inflicted on the bushing, but if the wrench does not fit and is permitted to "climb" the bushing, i. e., to hold only at the corners of it, the bushing is apt to be strained to such an extent that it will not fit evenly on the gasket with the consequent results of a compression leak.

The New York Automobile Show.

Preparations by the committee in charge of the National Automobile Show to be held in Grand Central Palace and Madison Square Garden, New York, January 11 to 25, 1913, indicate that the exhibition, which will be divided into two parts, will be a record breaker from every point of view. Both as a spectacle and as an exhibit of what is best in motor car and accessory making it promises to be the foremost exhibition of its kind ever presented.

The preparatory work has been going on for several months. Contracts for steel construction, decorating, sign making and other branches of the exhibition have been awarded and the allotting of car space has already been completed.

Plans for remodelling Madison Square Garden and Grand Central Palace have been completed and a scheme of decoration for both buildings has been worked out which will be unusually attractive. The interior of Madison Square Garden will be practically reconstructed. The skeleton steel construction which will support the balconies will be erected entirely independent of support from the walls of the Garden. The interior of Grand Central Palace will be enriched with trellis work and floral decorations which will add greatly to the now beautiful interior.

Applications for exhibition space have been pouring in daily at the offices of the Automobile Board of Trade No. 7 East Forty-second Street, New York City, and Merle L. Downs, secretary of the Show Committee, is allotting whatever floor room, if any, is left.

Might Have Been Worse.

From Edgar C. McCall, Newark, New Jersey.—The other day when out riding in my Ford touring car I had occasion to glance down at my left rear wheel and noticed it was wobbling slightly. After riding a few miles further I heard a slight grinding noise and saw that the wheel was running quite crooked.

I crawled along for five miles to the railway station (had to repair a blowout in the meantime. "It never rains but it pours") and sent my party of four home by train. I then set off to cover the dozen miles to home and the garage. I tried to choose the smoothest road and crept along about ten miles per hour, wondering every minute if that left rear axle would break and leave me stranded. However, luck was with me and I reached the garage in safety.

Next morning I started in to find what was the matter. I jacked up the body of the car at the rear and took out the shackle pins connecting the ends of the spring to the rear axles. Detached the brake rods at their front ends and took out the four bolts which fasten the two halves of the cover over the universal joint, right back of the engine and gear housing.

Then I pulled away the whole rear axle supported on the rear wheels and carrying the drive shaft and torsion rods. (One of the good points of a Ford is its accessibility.)

After removing the nuts which bolt the drive shaft housing to the differential housing and the two nuts at the front end of the torsion rods, the drive shaft with its pinion and housing was pulled away from the rear axle. Both wheels were then taken off with the aid of a wheel puller.

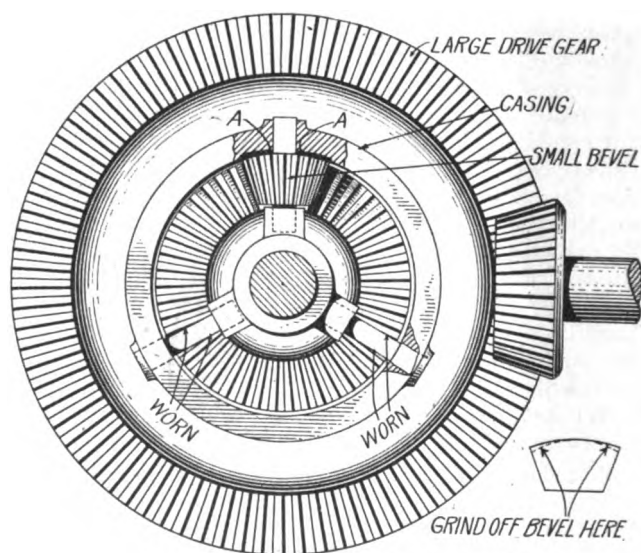
Next the two halves of the differential housing of the rear axle were taken apart by removing all the

bolts which hold them together. It is necessary to use a thin socket or box wrench to do this. The two halves were then pulled off, to right and to left, exposing the live axles and the differential gear.

The end of the left rear axle on which the hub of the wheel is keyed, was found to be badly bent and cracked almost all the way round. It was lucky for me that it had not parted under load and the wheel dropped off. It looked as if the car must have skidded up against the curb or had a mishap of that kind but as I alone drive the car I know positively that nothing like that had occurred.

The differential was then tested by revolving the axles by hand in opposite directions and it was found almost impossible to turn, showing that something was binding inside the differential. As the differential is rather a mystery to most people I hesitated to take it apart. However, I took off the nuts connecting the two halves of the differential casing and pulled it apart. On one of these halves is bolted the large (40 tooth) drive gear.

The two halves when bolted together hold a three



pronged "spider," which is a circular forging having three prongs or spindles on its circumference. The outer ends of these spindles are clasped by the two halves (before mentioned) and on them revolve the three small differential bevel gears. It was found that the bushings of these gears were worn as were the spindles on which they revolved, necessitating a new "spider" and new bushings.

This looseness caused the backs of the small bevels to bind on the inside of the two halves of the differential casing as shown by the fact that they had cut slightly into the casing, as shown at A in the sketch. My theory is that this is what caused the left rear axle to bend.

Owing to the fact that the car is almost always turned from right to left it follows that any stiffness in the differential would throw an extra strain on the left wheel and have a tendency to twist it off thus causing the axle to crack and bend. I ground off the backs of the small bevels near the edge so that they could not bear on the casing as before and hope to have remedied all the trouble.

The strange part of it is that the stiffness in the differential was not noticed previous to the bending of the axle.

STEAM CAR DEPARTMENT

This department is intended for owners, users and others interested in the steam car.

Those who have trouble with their steam cars are asked to give clear and full particulars, and their queries will be answered as correctly as possible by an expert. It will be considered a favor if our readers will contribute to this department, giving such information as may be useful to others using the steam car.

New Things That Help.

From D. M. B. Stine, Iowa.—While not having any trouble with my car (am running a White 30) I have found out a few things that may help some other reader.

If dry cells are allowed to remain outside in freezing weather they will soon deteriorate. They are never so good after being thawed out.

If those who have a hard time starting their car in cold weather will get a piece of red gas hose, slip one end over the connection on your Prestolite tank and the other into the air intake on the carburetor, then let just enough gas flow through so you can smell it and crank your motor, it will usually start no matter how cold the engine. The gas is drawn into the cylinders with the mixture so there is no danger of having it all go into one cylinder and blowing it up.

I always use rain water in my radiator and am never troubled with crusts or scales, I also think the water keeps cooler.

By putting interliners in two old casings that were about worn out I have got over eight thousand miles out of them. They are 32 x 4 casings and my car weighs 2900 pounds. I also find that oversize casings more than pay for the difference in cost; less trouble in every way and an easier riding car.

By wrapping the lower half of the springs with black tire tape you reduce the rebounding and jumping of your car considerably, giving the wheels better traction, especially on rough hills. It also keeps the lubricant from coming out from between the leaves.

Looking For Trouble Where Trouble Is Not.

From Frederick L. Smith, Pennsylvania.—In a steam car a prolific source of annoyance is back-firing. An ominous roar indicates to the driver, especially in a White, that the gas has ignited at the outlet of the vaporizer. In most cases the vaporizer is charged with the blame and subjected to a useless cleaning. As a matter of fact, the new steel vaporizers may be used for thousands of miles without the slightest necessity of cleaning. The real trouble is caused by a clogged pilot light, which, while it still burns, does so with a dull, "smudgy," yellow flame. The gases accumulate, ignite, and then there is a back-fire. See that the pilot light burns with a good blue flame, and with evidence of power, indicated by a mild roar, when opened sufficiently, and you will rarely, if ever, be annoyed by a back-fire which always occurs at unfavorable moments, especially on hills, necessitating shutting off the main burner and a consequent cooling of the steam and loss of power.

A big fan belt of fabric was the source of lots of unexplained noise. One expert said there was a broken ball. Another even went so far as to say the crank had a broken ball race. The real trouble was due to grease getting on the belt and then becoming sticky, making the pulleys jump at low speed, thus creating the impression of dire disaster in an other-

wise quiet running engine. A little gasoline on cotton waste removed the offending substance and the fan belt performed its duty in absolute silence, though hours had been spent to locate an imaginary source of the trouble.

It is good common sense to spend some time in observation and thought before tearing down a vital part of any machine. The beginner is altogether too prone, when trouble comes, to get to work on the machine, especially to the duty of separating it as much as possible into its component parts, and this is about the last thing to do.

Does Not Understand the Instructions.

From T. C. Fraley, New York.—Possibly some of your White customers can set me straight. I have a Model O, White, 1911, and have difficulty to understand the "cut-off pedal No. 91." Directions say: "The closer to the dash the lever is the longer steam is admitted to the cylinders and the less expensive." This would appear to me as using more steam and thus be more expensive. Again: "This pedal can be held in any position desired. The car should be run with the pedal as far from dash, on as great a cut-off as possible. By this means the engine is always running economically in steam and fuel. For country touring the pedal can be allowed to come further away from the dash than in city work. In bad roads this pedal should be pressed forward, thus increasing the cut-off (thus using it up faster)." Again they say: "This lever can be set in such a position that it would not be necessary to touch it." Again it says: "Run with pedal as far from dash as possible;" this would mean a very little cut-off and result in using an unusual amount of steam and fuel, the best results are obtained by running with as short a cut-off as possible." In starting they say: "Press cut-off pedal so that engine will get steam the full stroke." Have consulted engineers and many others and they fail to understand the directions, saying it is repeated and very indefinite. Can some White steam man put us on straight, as to how to use this cut-off pedal on hills and level roads.

(Note by the Editor.—In relation to the foregoing, it must be stated that Mr. Fraley's letter from which the above was transcribed is also "very indefinite." It is impossible to be sure what he himself says and what he is quoting from the White instruction book. In a case of this kind, the correct use of quotation marks is important, as is also the correct beginning and end of a sentence. We regret to state that otherwise interesting and instructive contributions must sometimes be thrown into the waste basket simply because they were somewhat carelessly written and of uncertain meaning.)

Spark Plug Gap.

The consensus of opinion among experts seems to be that the proper spark plug gap distance is 1-32 inch for a system using a battery and coil and 1-64 inch for a system using a high tension magneto. In bending the electrode to make this distance, bend only the outer one or ones as the case may be, leaving the central electrode straight, then if it is slightly turned in tightening the core the distance is not so likely to be altered.

In driving a car at high speed over level country the spark should be retarded to nearly dead center upon beginning the ascent of a hill as the engine will slow down. Failure to do this will produce knocking in the cylinders.

Winter Garments for the Car Owner.

—Many of our readers who intend to continue automobiling through the winter will be interested in a new advertisement which appears in this number from E. Roberts, Suite 9, 160 West 119th Street, New York City. Mr. Roberts manufactures a line of winter garments especially designed for use in an automobile and in this issue he makes an offer which should appeal to many of our readers as it is a particularly fair and liberal one. The offer is to send a manufacturer's sample fur lined overcoat on inspection and approval to any reader who may be interested. This garment is a black broadcloth, shell lined with the finest Marmot mink and has a Persian Lamb collar. The garment is made in all sizes and it is claimed would retail for \$75, but the middleman's profit is eliminated and the price to our readers is only \$35. Write to-day if you are interested, stating the size required, and the coat will be sent on approval so that you may examine it and try it on before purchasing, but it will be necessary, of course, for the inquirer to pay the express charges, which can be approximately estimated at any express office. In writing, do not forget to mention this paper.

Double Grip Woodworth Treads.

The Leather Tire Goods Company, Niagara Falls, N. Y., have just brought out what they call the Double Grip Woodworth Treads. These are studded on the middle with studs made of steel of special quality to grip on brick or asphalt pavements. Among the special studs are large, sharp studs about two inches apart for gripping on ice or hard snow. The large, sharp studs project about one-quarter inch higher than the other rivets. They are tempered glass-hard to give long wear and can be easily screwed off and new ones screwed on in their places if they become worn down. These Double Grip Woodworth Treads are made with a special water-proofed leather, reinforced by tire fabric that has proven so durable in the regular Woodworth Treads. Write for further particulars and price to the manufacturers at the above address.

Outgrows Former Plant.—The Jeffery-Dewitt Company of Detroit, manufacturers of the old and standard Reliance brand of spark plugs and the new J-D Visible, has been forced by increasing business to occupy new quarters in addition to their large original factory. Accordingly a new site on the East Grand Boulevard, the greatest motor way of Detroit, has been chosen. This well known firm is the only company in the United States engaged in the manufacture of spark plugs, which imports and blends the clays by its own formula, and bakes the porcelain for its plugs. These potteries are visited by large numbers of tourists yearly, who watch with interest the complex process of the forming and the baking of the porcelains. Free access is granted to all departments except one, in which the blending of ingredients according to a secret formula is performed in order to insure a heat defying hardness to the finished product. Plant No. 1, the original factory will, hereafter, be devoted solely to the manufacturing of porcelains and the machining of metal parts.

Important.—Car owners have learned a great deal about tires during the last few years, but there are several fallacies that it seems impossible to get out of the average automobile owner's mind. "The

belief that hot weather and road friction increase the air pressure in a tire to a dangerous point costs the car owners of this country millions of dollars every year," said Mr. C. S. Thompson, advertising manager of The Diamond Rubber Company, who is in New York City directing the campaign on Diamond Safety Tread Tires. "Because of this fallacy thousands of car owners habitually travel on under inflated tires, the 'soft' tire becomes bruised and cut and before long there is a blow-out. The internal friction in a tire caused by the bending of the material, especially the fabric, does heat the tire—but the softer the tire the greater the bending action and the more internal heat. The increase in air pressure due to heat is not nearly so great as car owners think. In our tires the engineers have allowed for four or five times as great a pressure as we recommend for them. To get maximum mileage the car owner should inflate according to a very simple rule—the pressure per square inch as shown by the pressure gauge should be 18 times the tire's cross section in inches. For instance, a 3½-inch tire should always be inflated to 63 pounds, a 4-inch tire to 72 pounds, a 4½-inch tire to 81 pounds and so on, regardless of hot or cold weather. If we could get tire users to follow this rule there would be far less mileage in the tire than the average owner injures to lives and a great deal more gets."

A Remarkable Prize Offer.—Lovell-McConnell Mfg. Company, of Newark, N. J., manufacturers of the celebrated Klaxon warning signal, have made a prize offer which ought to interest a great many of our readers. They will award 12 prizes amounting in all to \$250 for the 12 best letters, explaining why the bulb horn should be discontinued by car manufacturers as the customary signal in the equipment of their cars; \$100 will be paid for the best letter, \$50 for the next best and \$10 each for the ten next best letters. The competition will close at noon, December 15, and your competing letter must reach the Lovell-McConnell Mfg. Company before that time to be considered in the award. All competing letters must be addressed to the Lovell-McConnell Mfg. Company, Desk No. 40, Newark, N. J., and unless the desk number is given, the letter will not be considered at all in the prize competition. This matter of giving the desk number is a very important one and should not be overlooked. Awards will be made by a committee composed of several editors of automobile journals and of course the judgment will be absolutely impartial. Conditions regarding the form which the prize letter should take will be found in the full-page announcement of this company which appears on the inside front cover. Of course as this is a monthly publication the advertisement will appear but once, and we trust there will be a liberal response from our readers, as here is an opportunity to win a substantial prize with a very little effort. The letters to be eligible must not exceed 350 words, and must be written on one side of the paper only. Awards will be made as soon as possible after the close of the competition. The letters which are sent in will remain the property of the Lovell-McConnell Mfg. Company, and they will have the privilege of using them in their advertising if they so desire. Further information concerning the subject to be treated in the prize letters may be obtained in a booklet entitled "A Vital

Problem" which will be sent free upon request, if you mention this journal. Announcement regarding the prize winners will be made in a later issue.

Where Have My Profits Gone? American Sales Book Company, Elmira, N. Y., Publishers.

This is a book of 256 pages and it covers a wide variety of topics of interest to business men, mostly in relation to business systems and the necessary steps to properly put them in operation. Some of these subjects come under the head of retail store losses, big store methods, cash or credit, which? store advertising, creating public confidence, how every business is built up, the weakest link, the store of tomorrow, etc. These subjects seem well handled and to be full of common sense. One thing is specially refreshing about it: It is so completely indexed with sub-titles, cross heads, and alphabetical lists that one can find just what he wants almost instantly. The book contains some mighty good advice for retailers and other business men.

Internal Combustion Engines and Gas Producers. By G. W. Askling and E. Roesler. Published by J. B. Lippincott Company, Philadelphia.

This is an up-to-date work of over 300 pages and 178 illustrations. It is partly a translation and partly an adaptation of the authors' book on the same subject which was first published in Swedish in 1909. It is largely devoted to a survey of the industry as at present developed—theory, design, and the possibilities of practical execution. It is in two parts, the first being on the method of working internal combustion engines compared with that of other heating engines, and the various fuels employed in gas or gas producing engines, together with much other valuable information as to design and general rules for engine care, etc. Part II largely relates to gas engines and oil engines of different types. There is an index of unusual fullness so that the subjects treated can easily be found. On the whole, the book is perhaps the most comprehensive of the kind yet issued, and we are inclined to think it could not easily be improved. For the workshop of the engineer or that of the inventor, and for the use of students, it is invaluable.

For the first time since 1909 the Bosch Magneto Company will not exhibit its product at either the New York or Chicago automobile shows. The decision was reached on November 2 when cancellation was made of the applications to the Motor & Accessory Manufacturers for spaces. The move was made necessary by the division of spaces for this season's exhibitions, the spaces assigned being entirely too small for their requirements.

A Special Offer.—The Hagstrom Bros. Manufacturing Company of Lindsborg, Kansas, makers of the well-known Hagstrom Porcelain Guard Spark Plug, are making a special offer in their advertisement in this issue which will probably appeal to every motorist. The offer is intended particularly for the owners of Ford cars who have never yet used the Hagstrom plug. The manufacturers of this plug say there is a revelation in store for each person who takes advantage of this offer. But consult their announcement and write to them.

Send for free sample of The Automobile Dealer and Repairer.

MOTOR VEHICLE PUBLISHING CO.,
71-73 Murray St., New York.

The Trahern Garage Pump.—This pump is manufactured by the Trahern Pump Company of Rockford, Ill., and is designed and constructed primarily for lifting gasoline, kerosene, oils or liquids of any similar nature from an underground tank or reservoir and delivering to a receptacle at any point within a radius of 50 feet from the pump. It would seem to be an extremely useful pump for any garage to have. Full particulars concerning it with prices can be obtained by writing to the manufacturers as above. This same company also manufactures the Trahern Gasoline Storage Tank Pump. An original and essential feature of this pump is the valve trip, by means of which the valve can be opened and any surplus oil in the hose returned to the tank by reversing the motion of the crank, or if desired oil in the automobile can be returned to storage.

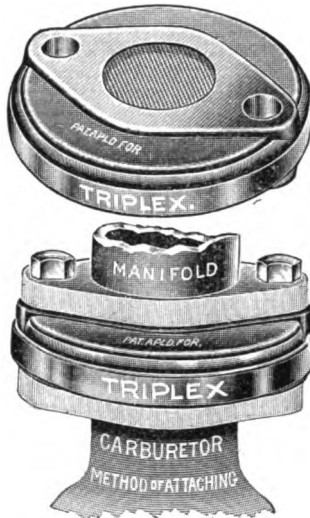
Goodrich Safety Tread Tires.—It seems hardly necessary to direct the attention of our readers to the advertisement of the B. F. Goodrich Company of Akron, Ohio, on our front cover. Everybody is likely to see it. Neither would it seem to be necessary to dwell particularly upon the merits of the Goodrich tires. This company has always prided itself upon the quality of its goods. It is manifest that the safety of a motorist in running rapidly depends upon co-operation between the brakes and the treads of his tires. No matter how good the brakes are, as this company states, your car will not stop unless the treads of your tires respond by gripping the road. The Goodrich Company has 100 branches and service stations and innumerable dealers everywhere selling their tires with this new safety tread. If you have never seen them go to your dealer and ask to see them.

K & W Reliners.—The K & W Mfg. Company, Third Street, Ashland, Ohio, have an announcement in this issue of their reliners, which should interest a great many car owners, as well as dealers. They want our readers to write for their K & W Accessory Catalogue, and prices of their reliners.

Standard Air Bag.—The Standard Air Bag consists of two expanding rubber washers joined by a flexible rod. Five minutes' work prepares the bag so that it will last for 20 to 25 cures. If the tubing hardens throw it away and put on another piece. The frame will last a lifetime. These bags are fully guaranteed and if after using a Standard Air Bag 30 days you do not find it satisfactory, the manufacturers say you can send it back and have your money refunded. They say this bag has stood every test in their own vulcanizing plant. Write for further particulars to the Standard Tire and Rubber Company, 104 Portland Street, Boston, Mass.

New Agency for Lee Tires.—The Chanslor & Lyon Company, a well-known supply house on the Pacific Coast, has taken the agency for Lee tires in that territory. This house was selected not only because of its prominence in the trade, together with thorough knowledge of the field, but also because this company has six branches, at San Francisco, Los Angeles, Fresno, Portland, Ore., Seattle and Spokane, thus forming the nucleus of a thorough selling system in one of the choicest territories in the country.

The Triplex.—This device which is illustrated herewith is said to finish the work which the carburetor sometimes leaves half done. It is claimed that it economizes fuel, increases mileage and prevents back firing. The manufacturers guarantee it to reduce fuel consumption 25 per cent., at the same time that it in-

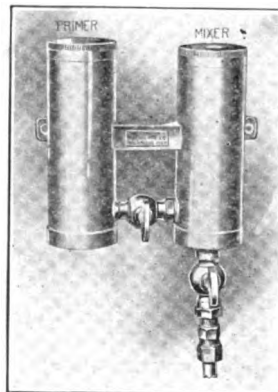


Bremer-Wilson Mfg. Co., Chicago, Ill.

creases power. It also prevents carbonization. This article is sold with the understanding that if it does not do what the manufacturers claim for it that they will gladly refund your money at the end of 60 days. Write for further particulars and descriptive circular to the Bremer-Wilson Mfg. Company, Dept. 10, Chicago, Ill.

A New Fuel Mixer.

The National Compound Mixer and Primer is composed of an auxiliary intake, an automatically controlled mixing valve and a priming attachment for instantly priming all of the cylinders at one operation. As is generally known not much more than one-half of the gasoline consumed by the ordinary motor is con-



National Primer and Mixer.

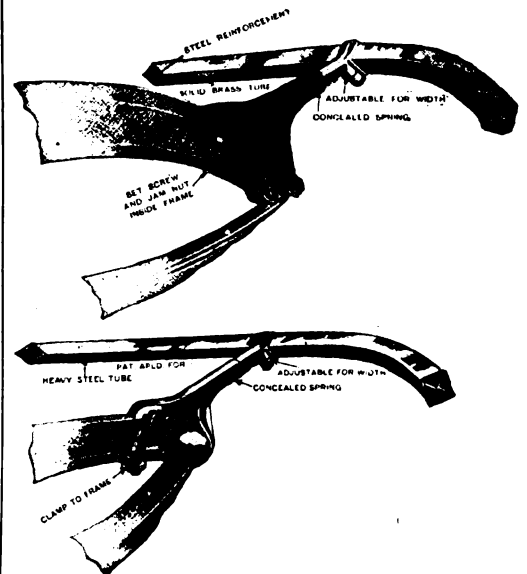
verted into actual gas. The balance, containing the less volatile parts, is drawn into the cylinders in the form of small drops, which only blaze during the downward stroke of the piston. This blaze is what causes the carbon to collect in the cylinders and on the spark plugs and valves. This fuel mixer will break up and mix with just the right amount of air

every drop of gasoline before it enters the cylinders, thereby doing away with carbon deposits, adding from ten to forty per cent. more power to the motor, using from ten to forty per cent. less gasoline.

The priming attachment is of special value in starting the motor. All the cylinders may be primed at once simply by opening the priming valve on the dash. As the gasoline is drawn from the primer into the cylinders, a quantity of air is taken with it, thereby insuring an explosive mixture. The weight of this device is but 1½ pounds, it can be easily attached and the manufacturers have some splendid endorsements from those who use it. For full information, address the National Manufacturing Company, Kalamazoo, Mich.

Merit Recognized.

The Cadillac Motor Car Company, and the Packard Motor Car Company, both of Detroit, Mich., have selected the Sager Diamond Bumper for their discriminating thousands of customers. This style of bumper is exclusively made by the J. H. Sager Company, Rochester, N. Y., who have been granted Letters Patent covering both mechanical and ornamental design.



The Sager Diamond Buffer—Two Styles.

It is a beautiful specialty; adds materially to the appearance of a car and, in fact, is an absolute necessity to protect the expensive tires, radiator, lamps and front fenders.

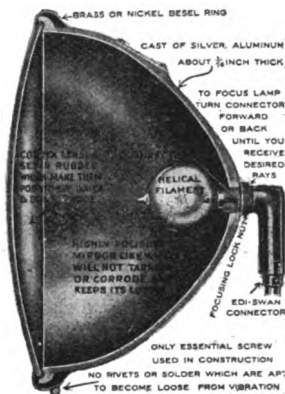
Sager Diamond Buffers are 100 per cent. stronger than any other type, an assertion made without prejudice, because the Sager Company also produce Channel and Round Tube Bumpers, as well as the Diamond.

That the Sager Diamond Bumper is the Beau Brummel in the bumper field is well attested in the fact that the Cadillac and Packard Companies chose it in preference to any other make or style.

"Paint Your Car Yourself."—This is the heading of the full-page announcement in this issue of the Arsenal Varnish Company, 2501 Fourth Avenue, Rock Island, Ills. A great many of our readers will, of course, be interested in what they have to say on the subject of painting cars by car owners themselves. Their booklet, entitled "The Car Beautiful," which describes the material used, will be sent free of charge to every reader who is interested enough to write for it.

Electric Star Headlights.

These lights have but one essential rivet; they are without solder and give perfect service without the necessity for repair for a good many years. They throw a powerful white light seven hundred feet ahead of the car and at the same time a well-diffused light to the side of the road. They thus quickly reveal curves in the highway and eliminate the possibility of collisions after dark. They are made of thick aluminum which does not tarnish or corrode and are guaranteed to give complete satisfaction. They are manufactured

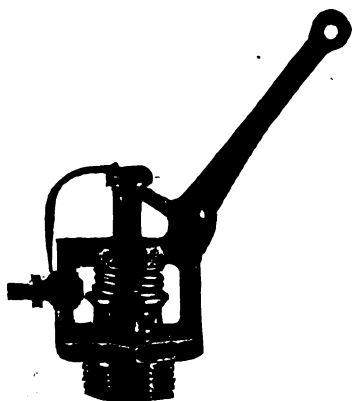


Electric Star Headlight.

by the Milwaukee Bronze Casting Company, Milwaukee, Wis., and if further information is desired concerning them, the firm will send a booklet which not only gives details of these lamps but some valuable information about charging batteries and wiring for electric lamps.

A Fuel Economizer.

The improved M. & M. Economizer, manufactured by Moller Bros., 700 Betz Bldg., Philadelphia, Pa., gives more speed and power and cuts out gasoline and ignition while going down grades, slowing up



M & M Economizer

or turning corners. It is easily attached and the firm guarantee it to increase the speed and power twenty per cent., to save forty per cent. of gasoline and to reduce the carbon by forty per cent. Although the M. & M. is used for obtaining more speed, it does not mean that your car should be going 50 or 60 miles an hour. When going at the rate of 15 miles per hour, and you are desirous of increasing your speed to 20 or 22 miles, it is not necessary to feed more gas, as the air being admitted into the valve of the M. & M. will give the desired increase with the same amount of gasoline. When running slow, it is often the case that the carburetor becomes choked up. This is due

to the fact that the carburetor is feeding a rich mixture and to make the engine run more smoothly, it will be necessary to let a small quantity of air into the M. & M. Economizer.

Marshalltown Motor Material Mfg. Co. of Marshalltown, Iowa, has changed its name to the V-Ray Company, Inc. This company manufactures the V-Ray Spark Plugs and advises us that it has increased its facilities and expects to put out five times as many plugs next year as it has done during the past year. They will have booth No. 629 at the Madison Square Garden Show, New York, and booth No. 31 at the Chicago Show.

On the 31st of October on the invitation of the B. F. Goodrich Company of Akron, Ohio, 400 of Cleveland's leading business men visited Akron for the purpose of inspecting the factories of this company. The inspection was accomplished by means of guides assigned to a certain number of visitors in such a satisfactory manner that in five hours from the time the party left Cleveland it was returned to that city safe and sound. It may not be generally known that 15,000 men are employed by the Goodrich Company. They have 65 acres of floor space in their factories and of course the visitors could not pretend to inspect more than the most interesting portions.

K W Electric Head Light Outfit.—The K W Ignition Company, 2817 Chester Avenue, Cleveland, Ohio, have a full-page announcement in this issue of the Electric Head Light outfit, as well as several other specialties including the K W Master Vibrator which this company manufactures. They say, don't simply ask for a catalogue, but tell them your troubles and they will help you.

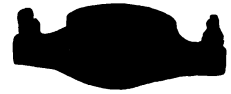
To Ford Dealers and Owners.—The Fulton & McCutchan Company, 1146 Michigan Avenue, Chicago, Ill., have an announcement in this issue addressed especially to Ford dealers and owners. They say every Ford owner is interested in the Ford Water Circulator which they manufacture. This circulator changes the thermo syphon system to force circulation. The way this is done will be found in their advertisement on another page. The water is forced through the cylinder water jacket by the positive drive of the worm screw, insuring rapid circulation with mechanical pressure back of it, giving a cool motor always. But consult the advertisement of this company on another page.

Steerease, a New Article.—This is an entirely new device and its object is to assist the ease and safety of steering an automobile where the ordinary steering wheel is used. Steerease is manufactured from a fine quality of rubber, specially molded and constructed to fit the steering wheels of the various kinds of motor cars and trucks. Many chauffeurs and car owners wrap their steering wheels with twine, rope, tape, etc., to prevent the danger of slipping, especially in wet weather. Steerease being slightly corrugated absolutely prevents slipping and makes a neat covering for the steering wheel. Being made of soft and pliable rubber it offers a firm and non-yielding grip. No gloves are necessary except for protecting the hands from cold. Readers who may be interested in this article can secure full particulars regarding the same by writing the Goodyear Rubber Hose & Packing Co., 221 Chestnut St., Philadelphia, Pa. A handsome

fully illustrated catalogue will be sent to any one who will mention this publication.

A Handy Vulcanizing Repair Kit.

The accompanying illustration is of a \$3 vulcanizer being placed on the market by the Electric City Specialty Company of Buffalo, N. Y. This vulcanizer weighs but 3 lbs. and can be carried in the car anywhere, and the manufacturers claim

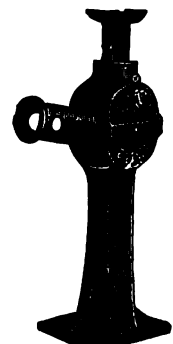


will vulcanize a tube in 15 minutes. Write to the Electric City Specialty Company, 167 Adams street, Buffalo, N. Y., for circular and full information.

Vanguard Wind Shields for 1913.—We have been favored by the Vanguard Mfg. Company of Joliet, Ill., with a circular illustrating and describing their line of wind shields for 1913. These are of the well-known ball bearing type and the price has been greatly reduced by improved facilities of manufacture. Dealers are requested to write for special proposition and car owners are requested to send for a circular.

The Colt Auto Jack.

A new jack which is being placed on the market is called the Colt Auto jack. Its manufacturers claim that this jack is superior in more ways than one to anything before placed on the market, combining beauty and simplicity in construction, and excelling in lightness and



The Colt Jack.

strength. This jack is double acting, raising the load with both upward and downward movement of the lever. Raise the shifts at the side, and the load is lowered in some manner. Height with bar down 11 inches; additional heights for higher axles when specified. Hoist of bar 6 inches. Weight 6½ lbs. Capacity one ton. Write to the manufacturers for fuller particulars. Batavia Clamp Company, Batavia, N. Y.

Hawthorne Pennant Holders.—These handy pennant holders for use on automobiles are manufactured by the Hawthorne Mfg. Company, 1 Spruce Street, Bridgeport, Conn. This holder is easily attached to the wind shield stay rods and it is adjustable to any angle and held in rigid position by our special bar clamp. Good agents are wanted for this article and dealers or car owners who may be interested should send their inquiries to the Hawthorne Mfg. Company, not forgetting to mention The Automobile Dealer and Repairer.



Mobiloil

No one lubricating oil is best for all cars. Gargoyle Mobiloil gives you a grade for each type of motor. Use the grade shown in our complete recommendations. Mailed on request.

VACUUM OIL COMPANY, Rochester, U. S. A.

General Sales Offices, 29 Broadway, New York City.

Spark Plug Insulators.

Spark plug insulators are made of a variety of substances, chief among them being mica, porcelain, china, glass and compositions. Porcelain, china and glass are liable to breakage when subjected to sudden strains while hot, but on the other hand their surfaces are impenetrable to oil and grease. Each class of materials has its own advantages as well as disadvantages.

The best direction which can be given for timing the spark is: "Advance or retard ignition until the motor pulls the best."

The simplest ways of heating the carburetor, cylinders, etc., are to wrap hot cloths about them, and to pour hot water into the circulating system and "turn her over."

Champion Priming Plugs.—Every car owner knows that it is often difficult in cold weather to start his car without priming. The Champion Priming plugs are devised to remedy this difficulty. With this plug priming is readily done. Just turn the needle valve back a few threads by hand, inject a few drops of gasoline and close again without removing your gloves. These plugs are described by the manufacturers as both sure and safe, because they create vaporization right beside the spark points, and it is possible to run with the needle valve open without danger to the porcelain from a hot exhaust blast. These plugs are for sale everywhere at \$1.25 per plug and are manufactured by the

Champion Spark Plug Company, 112 Upton Avenue, Toledo, Ohio, to whom all correspondence should be addressed. In writing for further particulars our readers are requested to mention The Automobile Dealer and Repairer.

Arsenal Liquid Silver.—This is a preparation for silver plating motor car brass or copper and the manufacturers state that it will silver plate these metals quicker and with less labor than any similar article sold for the purpose. This is only one of several specialties for automobile owners which are manufactured by the Arsenal Varnish Company of Rock Island, Ill., and we refer our readers to the attractive full-page advertisement which appears from this company

in the present issue. In all correspondence to them, please mention this paper.

The Motz Tire and Rubber Company has recently opened an office in Boston at No. 4 Dundee Street, in charge of M. A. Frank, for the sale of the Motz Cushion Tires, the demand for which, we understand, has been increasing steadily. These tires are said not only to save tire expense but power as well. They are being used on commercial cars and trucks extensively.

Send for free sample of The Automobile Dealer and Repairer.

MOTOR VEHICLE PUBLISHING CO.,
71-73 Murray St., New York.



This Tire Gauge FREE - - -

Reduces Tire Costs
Increases Resiliency
Lessens Chances Of Puncture
Accurately Tells How Much
Air In Tires

This unusual offer is made for the purpose of placing in every car owner's hands an

ALLEN TYROMETER

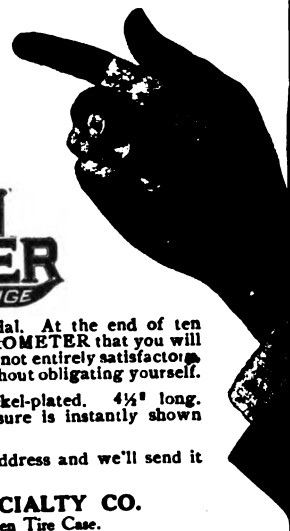
TIRE PRESSURE GAUGE

We offer it to you for a Ten Day Free Trial. At the end of ten days you will be so pleased with the TYROMETER that you will gladly remit the price, which is \$1.00. If not entirely satisfactory you may return TYROMETER to us without obligating yourself.

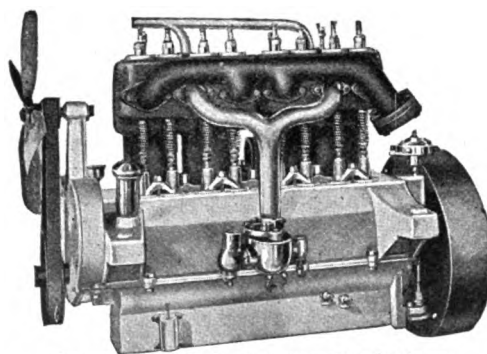
Absolutely accurate. Handsomely nickel-plated. 4 1/4" long. Has clip cap. Press on valve and pressure is instantly shown and held until you release sliding band.

Drop a post card with your name and address and we'll send it at once by mail.

THE ALLEN AUTO SPECIALTY CO.
Manufacturers of the famous Allen Tire Case.
1924 Broadway, New York.



THE SILENT, POWERFUL BRENNAN



Four Cylinder, Model B, for any special or standard make car.
Get our Catalog. WRITE US NOW.

BRENNAN MOTOR CO., SYRACUSE, N. Y.

READ THIS LETTER

It is one of many like it

OCEAN CITY,

Aug. 1, 1912.

BRENNAN MOTOR CO.,

Syracuse, N. Y.

Gentlemen:—Regarding the 4 cylinder, 4 1/2 x 5, model B motor I purchased from you for my Elmore car, beg to say the engine works fine. I am certainly pleased with it. You cannot hear the engine running when standing a few feet away.

Respectfully yours,

R. E. STITZER.

We also make

Transmissions,

Sizes 12 to 60 H. P.

Cameron's Great Car

Find a "40" Like It

There are 72 makers this year building Forties. For legions of motorists are demanding cars of reasonable size and power.

Each of these makers strives in some way to outdo the others. As a result, some of the most luxurious cars ever built are now in the Forty class.

And prices on "40's," since this war began, have been fairly cut in two. So some of the greatest values in Motordom now are in 40-horsepower cars.

Find if you can, among our 72 rivals, any value that compares with this.

300 Improvements

We have spent four years on the Michigan "40." We have sent out and watched 5,000 cars. We have worked out some 300 improvements.

Our engineer-in-chief is W. H. Cameron, who has built 100,000 cars.

For body designer we have John A. Campbell, whose body designs are used by kings.

Each part and detail is built by an expert, picked out by Cameron. After four years, the result is one of the greatest cars that ever went out from a factory.

Electric Lights—Four Speeds Big Tires—All for \$1,585

In the Michigan "40," W. H. Cameron reveals his splendid genius.

He has given you safety, by making all driving parts sufficient for a 60 h. p. car.

He has given you economy by using extra wide tires. He has given you comfort by his 14-inch cushions, by wide, long springs, and by unusual room.

He gives you the luxury of hand-buffed leather, and a 22-coat body finish.

He gives you four forward speeds, extremely rare in cars under \$3,000. He gives you electric lights.

And, by enormous output and model equipment, we have made it possible to give you all this for \$1,585.

What Other Car Compares?

What other car in the whole Forty class gives you this much value?

Make your comparisons. Watch all the costly features in which makers skimp. See if any car, built by able men, makes an offer this year which compares with this. That is the way to get the utmost from this war of Forties.

Write for our 1913 catalog, and we will tell you where to see this car.

Michigan Motor Car Company, Kalamazoo, Mich.

Owned by the Owners of the Michigan Buggy Co.

Michigan "40"

\$1,585

With All These
Special Features:

Four forward speeds, like all leading foreign cars.

Electric lights with dynamo.

Oversize tires—35x4½ in.

40 to 46 horsepower.

Cylinders—4½x5¼.

Wheel base, 118 inches.

Rear seat, 50 in. inside.

Cushions, 14 inches deep.

Center control.

Left side drive.

Brakes extra efficient — drums 16x2¼ inches.

Springs 2½ inches wide, 37 and 50 inches long.

Firestone demountable rims with extra rims.

Steering post, clutch and brake pedals all adjustable to fit any driver.

Body finish 22 coats.

Nickel mountings.

Electric headlights, very powerful, 12½ in. diameter.

Sidelights flush with dash.

Windshield built in.

Mohair top, side curtains and envelope.

Electric horn.

\$50 4-inch Speedometer.

Foot rail—robe rail.

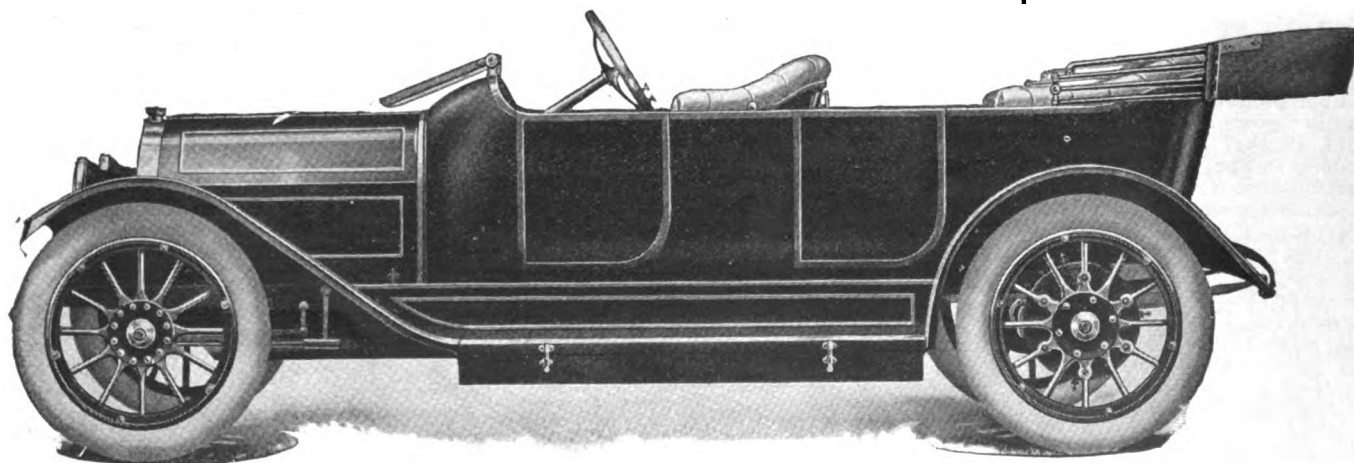
Rear tire irons.

Tool chests under running boards.

An average of 50 per cent over-capacity, to allow big margins of safety.

Self Starter

Either gas or electric, furnished at moderate extra price. We do not include it because men differ about the type they want.



Please mention the Automobile Dealer and Repairer when writing to advertisers.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, ETC., OF AUTOMOBILE DEALER AND REPAIRER.

Published Monthly, at 71 Murray Street, New York City.

Required by the Act of August 24, 1912.

Editor—A. A. Hill, 559 West 183d Street, New York City.

Managing Editor—No other editor except Mr. Hill.

Business Managers—M. T. Richardson, Ridgewood, N. J.; F. R. Whitten, 190 Wadsworth Avenue, New York City.

Publishers—Motor Vehicle Publishing Co., 71 Murray Street, New York City.

Owners—Motor Vehicle Publishing Co., 71 Murray Street, New York City.

Stockholders—M. T. Richardson, Ridgewood, N. J.; F. R. Whitten, 190 Wadsworth Avenue, New York City; Mrs. A. Louise Girardeau, Monticello, Fla.; Mrs. Mildred Ulmer, Monticello, Fla.; Mrs. Harriet L. Johnston, Rochelle Heights, New Rochelle, N. Y.

Known bondholders, mortgagees and other security holders, holding 1 per cent or more of total amount of bonds, mortgages or other securities: No bondholders, mortgagees or other security holders.

MOTOR VEHICLE PUBLISHING COMPANY,
M. T. RICHARDSON, President.

Sworn to and subscribed before me this 1st day of October, 1912.

(Signed) W. H. ROSE,
Notary Public, No. 68.
(My commission expires March 31st, 1913.)

Soldering Iron.—In this issue C. K. Hoerle, Torrington, Conn., offers in our advertising columns his perfected soldering iron which he says heats up in one minute. It can be adapted to any gas jet, generator or Prest-O-Lite tank. Repairmen and garage owners should write to him for descriptive circular and price.

Cigars on Trial.—Our readers who have not yet consulted the advertisement of Herbert D. Shivers, Inc., 913 Filbert Street, Philadelphia, Pa., on another page, should do so and give his cigars a test. He offers to send a box of fifty of his Panatelas, which have a filler of the best Havana—the clean, long, Cuban-grown leaf. The wrapper is genuine Sumatra. You don't have to send him any money. You simply mention the Automobile Dealer and Repairer, order the cigars, test them and if you are pleased, send him \$2.50. If you don't like them after smoking ten, you have the privilege of returning the cigars at his expense and the experiment will cost you nothing. The writer has smoked this particular brand for several years and can testify as to its merits.

Tire Pressure Gauges.—A. Schrader's Sons, Inc., 28-33 Rose Street, New York, have an important full-page announcement in this issue, with respect to the Schrader Universal Tire Pressure Gauge. They have acquired the entire right, title and interest in and to the Twitchell Tire Gauge Patent. It would appear from this that other manufacturers of gauges will be compelled to secure a license from A. Schrader's Sons before they can safely continue the manufacture of gauges which infringe the Twitchell patent; but consult the announcement on another page. The Schrader Universal Tire Pressure Gauge can be obtained from supply dealers and garages in all parts of the country or direct from the manufacturers as above.

McIntyre 6-40 Limited.—No reader interested in automobiles should overlook the full-page announcement in this issue of W. H. McIntyre Company, Auburn, Indiana, briefly describing the McIntyre 6-40 Limited, at \$1485. This car has four speeds forward, unit power plant, three point suspensions and is fully equipped. A few more agents can secure the opportunity to sell this car, and the manufacturers have an attractive proposition to make.

Why They Keep On Buying

My method of selling cigars by mail is unique and interesting. I get lots of orders from smokers who accept my offer out of curiosity. After the first shipment they usually remit and re-order. The cigars have proved my claims for them. Their uniformity of flavor and free-burning quality are unusually satisfactory, and I have made a regular customer.

I manufacture cigars in Philadelphia in a factory that is the cleanest I know of. I make 17 different cigars, but my most popular cigar is my Panatela.

My Panatela has a filler of best Havana—the clean, long, Cuban-grown leaf. The wrapper of my Panatela is genuine Sumatra. This cigar, like all my cigars, is hand made, by skilled adult men cigar-makers.

I sell this cigar direct from my factory to the smoker—by mail. I secure orders through advertising, and hold the business of my customers by the quality of the cigar.

Selling direct saves selling expense. My Panatela at \$5.00 the hundred is the regular 10c. goods of the trade.

My Offer is: I will, upon request, send fifty Shivers' Panatelas on approval to a reader of *The Automobile Dealer and Repairer*, express prepaid. He may smoke ten cigars and return the remaining forty at my expense, and no charge for the ten smoked if he is not pleased with them; if he is pleased, and keeps them, he agrees to remit the price, \$2.50, within ten days.

For nine years I have sold this cigar by mail, breaking even on initial orders and trusting to repeat orders for my profits.

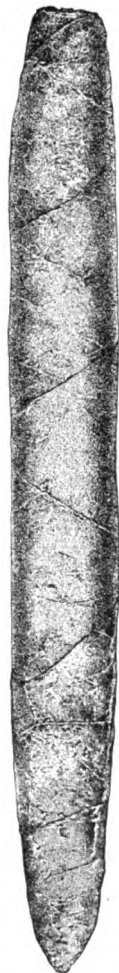
I would like you to try a box of my cigars on the terms of my offer. Acceptance of this offer does not obligate you in any way.

In ordering, please enclose business card or give references, and state whether you prefer mild, medium or strong cigars.

HERBERT D. SHIVERS

913 Filbert Street

Philadelphia, Pa.

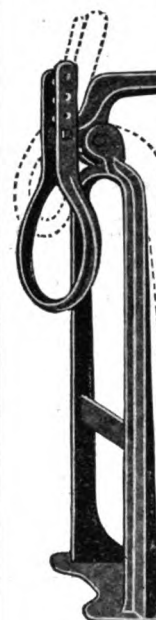


Shivers' Panatela
EXACT SIZE
AND SHAPE



MOORE TIRE-SAVING JACKS

\$6.50 Per Set of
Four—Delivered



THE best of tires wear out plenty fast enough while working on the road, without hastening their destruction when they're supposed to be "resting" in the Garage!

The weight of your car bearing down continually at one point, makes them flabby, unable to resist wear—actually kills the elasticity—the very life of the rubber—and paves the way for punctures, blow-outs, early destruction of the entire fabric.

Get a set of Moore Tire-Saving Jacks—and relieve your tires of every ounce of life-robbing weight-strain—in two minutes' time! Simply slip padded loop on hub and press down lever. No effort! Boy can easily raise heaviest car. And the lift that frees the tires from needless weight raises them clear of the rubber rotting grease on your garage floor.

For Winter Storage—Great!

Don't "block up" your car for the winter. A set of Moore Jacks will do the work just as well—and when a nice day comes along, you're ready for a spin in less time than it takes to tell about it.

If your dealer cannot supply you, send in your order direct.

J. C. MOORE
& CO.

326 Wisconsin St.,
Racine,
Wis.



J. C. MOORE & CO.,

326 Wisconsin Street, Racine, Wis.

Please ship, at once, one set of Moore Tire-Saving Jacks for which \$6.50 is enclosed herewith.

Name.....

Address.....

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Classified Advertisements

Under this head will be printed advertisements of Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines For Sale or to Exchange, at the uniform price of three cents a word, including the name and address, for each insertion, payable in advance. No advertisement will be inserted for less than 50 cents, however small. Remittances may be made in postage stamps or in any convenient way.

Classified Advertisements

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., N. Y. City.

PATENTS SECURED—C. L. Parker, Patent attorney, 962 G Street, Washington, D. C. Inventor's Handbook upon request.

CYLINDERS REGROUND, and fitted with new pistons and rings for \$15.00 per cylinder. We make parts and cut gears of all kinds. Send us your old parts and we will repair or duplicate them in record time. Cracked cylinders, gear cases, etc., welded and made good as new. Aluminum, bronze and brass castings of every description. Phosphor bronze bushings in the rough carried in stock. Address, The Adapt Machinery Company, 1624 Wabash avenue, Chicago, Ill.

DON'T FORGET.

FORD AGENTS—WE MAKE A SPECIALTY of Dust Hoods to cover Top when clashed down for Model T Ford 1910-1911-1912 Cars. Write for prices, also Cellulosa, best Substitute for Glass used in Automobile and Buggy Storm Fronts, Side Curtains, etc., Sheets 20 x 36 in. 86c, 12 x 30 in. 86c, 18 x 30 in. 45c, 20 x 24 in. 68c, postpaid. Haas Storm Front Co., Coldwater, Mich.

AUTOMOBILE boilers bought, sold and repaired. Lucas & Son, Bridgeport, Conn.

MODEL T FORD OWNERS—You need my valve adjusters. They make a good car better. More power, better mileage, less noise. A good proposition to owner agents. Ira Lavender, Webster City, Iowa.

N. E. AUTO LIST—Weekly registrations of all N. E. States as reported, \$10 yearly; year book \$3. Auto List Co., 138 Pearl St., Boston.

500 NEW pressed steel auto frames 163 in. long, 38 in. wide. Send for sketch. \$10.00 each. Lucas & Son, Bridgeport, Conn.

BROKEN CYLINDERS AND CRANKCASES welded expertly and guaranteed. See our adv., page 18, for details. Waterbury Welding Company, Waterbury, Conn.

TIRE BARGAINS!—A. C. C. A. Prices Talk! Diamond, Goodrich, and other standard makes. Guaranteed. Every size for every rim.

28x3—\$6.00 32x3—\$8.00 28x3½—\$9.25
30x3—7.00 34x3—9.00 29x3½—10.00
Also all other sizes and Tubes proportionately low. Shipped on approval. Also 1000 motor cycle tires sacrificed. Write today for Price List. The Automobile and Cycle Company of America, Dept. Six, 1769 to 1787 Broadway, New York City.

AUTOMOBILES—A. C. C. A. Prices talk! Every make, every model. Hundreds runabouts, racy roadsters, five seven-passenger touring cars, \$50 up. Guaranteed five years. Shipped freight prepaid! Write today for largest illustrated Catalog published! The Automobile and Cycle Company of America, Dept. Five, 1769-1787 Broadway, New York City.

DELIVERY CAR, closed body, 10 h. p.; just spent \$100 overhauling. \$150 new body and painting; will sell \$200. Chatfield, 312 W. 52d St., N. Y. City. (Telephone).

PORTABLE GARAGES

Garages—Portable-permanent, steel or wood. Knapp System, 123 Liberty St., New York City, N. Y.

CYLINDERS REBORED, pistons and rings fitted, gear cutting of all kinds and materials, transmission and bev. gears of nickel steel hardened and tempered, guaranteed better than factory, crank shafts, connecting rods, crank cases, axles, any part of auto or motor reproduced like original, phosphor bronze bushings carried in stock, send old or broken parts to go by. The shop of quality, McCadden Machine Works, Minneapolis Branch, Minneapolis, Minn.

WELDING—\$\$\$\$\$ saved on auto parts. Ship all broken castings to us. Save time and \$\$\$\$\$. National Welding & Mfg. Co., Incorporated, Mfrs. of Complete Welding Plants, Welders and Brasers of all Metals, 526 Jackson Blvd., Chicago, Ill.

WHEN your tires or tubes need repairing, send them to us. Our prices are lowest, we are always prompt and reliable. We sell all kinds of tires and accessories at special prices. It will pay you to "Get Acquainted." New York Steam Auto Tire Works, 212 West 52nd St., New York City.

FORD "T" OWNERS—Complete Magneto Lighting Outfit including large silver-plated reflectors and Tungsten bulbs, \$35.00. John Wilson, Jr., Edgewood, R. I.

AUTOMOBILE CYLINDERS reground, new pistons and rings fitted. Garage air compressors. Cast Iron Brazing Co., Manchester, N. H.

ANDRE G. CATELAIN makes a specialty of overhauling motors and welding cases. Foreign and domestic cars. If out of town ship motor and case in. 1446 Indiana Ave. (Calumet 1187), Chicago, Ill.

EXCLUSIVE AGENCIES are to be established throughout the United States for our well-known Motor Truck Grips. Wide awake representatives desired. Fill applications at once. Federal Chain & Mfg. Co., 376 Birnie Ave., Springfield, Mass.

TOPS REBUILT, recovered and repaired. For particulars address C. G. Meyer & Son, Tiffin, Ohio.

ATTENTION—Have a few manufacturers samples, gentlemen's black broadcloth fur lined overcoats, lined throughout with Australian mink, large genuine Persian lamb collars, size 36 to 48, value \$75, will sacrifice for \$35 each. Also several ladies handsome long fur coats, satin lined, worth \$90, while they last \$35; and few large size fur robes, plush lined, \$15 each. All guaranteed new. Examine before buying. Send express charges. Will send on approval. Write or call. E. Roberts, Room 9, 160 West 119th St., New York.

SCORED CYLINDERS repaired \$12. No enlargement of bore—no need for new pistons and rings. Send piston with cylinder. Absolutely reliable method. References, testimonials and full details on request. Waterbury Welding Company, Waterbury, Conn.

TRUCK AGENTS WANTED

Commissions paid without the purchase of demonstrator. If you have any prospects send for catalogs and discounts, 1500 lb., 2000 lb., 3000 lb., 4000 lb. Four cylinders. S. A. E. tires, all oversize. Ideal Auto Co., Fort Wayne, Ind.

AUTOMOBILE AGENTS.

I want local agents in every county in the United States to handle a popular-priced line of automobiles; a good name and reputation for integrity counts more with us than money or experience; if you have \$300 and can furnish bond, you can procure the agency for our high-grade car and we will furnish you with demonstrator. For full particulars address

R. C. LEWIS.

Sales Manager, Box 55, Milwaukee, Wis.

BROKEN CRANKSHAFTS, crankcases, cylinders, flywheels, gear teeth, pistons, perfectly welded and machined ready to replace. Scored cylinders made new. Booklet, Atlas Welding Works, Rahway, N. J.

FRANKLIN 30 H. P. TOURING CAR—Just overhauled. Perfect condition. Top, windshield, electric lights. Cost \$3000.00. Will sell for \$425.00. Address Box 918, Dayton, Ohio.

ELECTRIC HEAD LIGHTS—At less than cost. I have six pair of brand new electric head lights 8½ in. front, Sprague-Waldo make, which I will sell for \$8.00 per pair f. o. b. destination. Push button switch and 25 feet of wire included. W. R. Brewer, 430 So. Green St., Chicago, Ill.

GOOD AGENTS WANTED

To sell new invention for automobiles. Saves 1-3 gasoline. Don't delay. Write us at once for territory. We have salesmen making \$50.00 per week. Natl. Mfg. Co., Kalamazoo, Mich.

MAILING LISTS—Automobile owners, dealers, garages, repair shops, commercial car owners, or any make of car. Owners' Auto List Co., Albany, N. Y.



The Livingston Radiator

PROVED BY TEST

Radiators made or repaired for any type car.

Have a new radiator made for your car and increase its value 25 per cent.

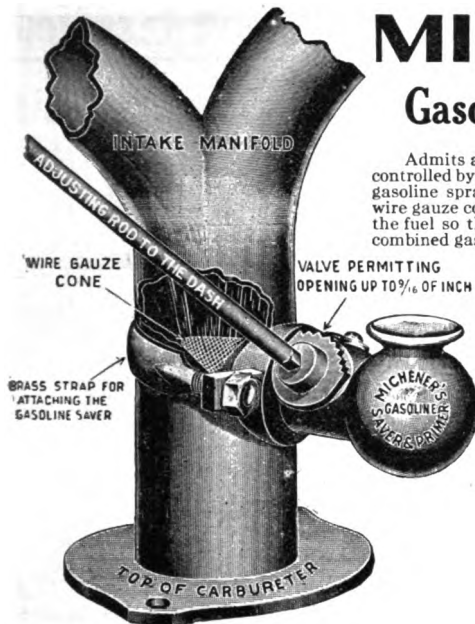
Our corps of expert repairmen at your service. All charges based on time consumed. Results guaranteed.

Send in your old radiator and get estimate.

LIVINGSTON RADIATOR AND MFG. CO.

136 W. 52d St., New York City

Please mention the Automobile Dealer and Repairer when writing to advertisers.



Pat. Sept. 10, 1912.

MICHENER'S Chain Carbon Remover

The one method that never fails. Costs nothing to use. Cleans out every bit in a few minutes. Increases power, prevents knocking and makes the motor run cooler. More economical and efficient than scraping or any other method.

Made of soft, tough wire. 90% copper. Guaranteed absolutely harmless to motors. Thousands in regular use. Recommended by automobile manufacturers. Get two to clean two cylinders at a time.

E. S. MICHENER

800 Washington Street, New Castle. Pa.



Pat. April 12, 1912.

75 cents each; 3 for \$2. Postpaid

State make of motor when ordering.

MICHENER'S Gasoline Saver and Primer

Admits auxiliary air above the carburetor, the amount being controlled by an adjusting rod on your dash or starting post. The gasoline spray from the carburetor is thoroughly broken up by a wire gauze cone and mixed with the incoming air. This vaporizes the fuel so that when it reaches the cylinders it is a chemically combined gas of the greatest explosive power.

This device positively saves at least 25% of your gasoline and at the same time greatly increases the power of the engine. It produces wonderful results because it really accomplishes what the best carburetors merely attempt.

For cold weather starting some gasoline in the mixer bowl makes an infallible starter. When coasting down hill use your motor as a brake by closing the throttle and opening the air valve. It feeds the motor pure air, saving gasoline, saving brakes, saving effort and cooling the cylinders.

Send for booklet and further information.

Mosler Spit Fire
Plugs
ARE THE BEST
A. R. MOSLER & CO.,
P. O. BOX "M",
MT. VERNON, N. Y.



AUTOMOBILE OWNER

If you are tired paying the usual high list price for Auto Supplies, write for our 35% catalog.

35% AUTOMOBILE SUPPLY CO.

97 Chambers St., New York.
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Auto TOPS
Write for catalog and prices. We can save you money.
\$22.00
BUOB & SCHEU,
Court and Broadway, Cincinnati, Ohio.

IT PAYS TO ADVERTISE

IN THE

AUTOMOBILE DEALER AND REPAIRER

WRITE FOR

ADVERTISING RATES

Battery and Coil.

"Probably the most difficult task the automobilist is called upon to master is the ignition system," says William H. Stewart, Jr., of the Stewart Auto Academy, New York City. "To the operator who has no knowledge whatever of this important part of the automobile, there is plenty of trouble in store sooner or later.

"While the magneto is much to be preferred for ignition purposes, and is now considered a regular part of the equipment, the battery and coil system with timer has by no means passed into oblivion. And at this time I wish to offer a few suggestions regarding the battery and the coil system.

"In automobiles using two entirely separate types, it often happens that the battery and coil system becomes disabled from mere want of use. This will be noticed in the spark plugs especially, which have a tendency to foul and become carbonized when not in service. Also the battery, especially the storage type, will depreciate in efficiency very rapidly when not used.

"A storage battery should be fully discharged and recharged again at stated intervals in order to preserve the efficiency. Many operators have wasted much energy and time in cranking their cars, feeling confident that the battery was all right because it had not been used much. With a normal battery charge, say of not less than six volts, the transforming coils should not refuse to work. If so, a thorough examination should be made of all the primary connections, including those of the timer.

"It very often happens that the contact maker in the timer becomes disarranged, permitting an open circuit. This result is the same as produced by an open switch, only harder to overcome. In order to remedy this, one must have a working knowledge of the engine in order to properly reset the timer. This accomplished, with the order of firing correct, the coils should respond in their

respective order. If not, the vibrators should be cleaned and adjusted by ear until each vibration resembles the buzz of the bumble bee."

High and Low Tension.

It requires high tension or high voltage current to jump the gap in the spark plug and if a magneto produces this high tension current without any external boosting apparatus it is called a high tension magneto.

If a magneto produces low tension current and requires a spark coil to boost it to high tension current so it will jump the gap in the plugs, this magneto is called a low tension magneto.

A high tension magneto is a complete ignition system all in one unit and requires no spark coil or timer or batteries of any kind. The high tension cables run direct from the distributor on the magneto to the spark plugs.

In order to use the high tension magneto there must be some provision on the motor to gear drive the magneto at exactly crank shaft speed for two and four cylinder motors, and at 1½-crank shaft speed for three and six cylinder, or, if desired, it can be driven by sprocket and chain.

The high tension magneto does not run electric lights.

The low tension magneto is simply a reliable source of current to replace batteries and works in connection with a vibrating spark coil and timer and as a timer is used there is no distributor on this magneto, and it is not necessary to gear drive it. Belt or friction is preferable because the speed is about four or five times crank shaft speed.

These low tension magnetos can be mounted in any position, will run in either direction, and any model can be used, the difference being merely for convenience in attaching to the motor.

YOUR SAFETY

Actually Depends on Quick-Acting Brakes

TRADE MARK
Raybestos
REG. U.S. PAT. OFF.

"THE ORIGINAL AND BEST ASBESTOS BRAKE LINING"



No other lining compares with RAYBESTOS because no other lining has the same high QUALITY. RAYBESTOS is made of the finest long-fibre asbestos—which gives longest wear and maximum efficiency.

RAYBESTOS is woven in special looms. It is treated and finished by a secret process known only to the manufacturers. Every inch of RAYBESTOS is subjected to gruelling scientific tests before being shipped. If the fabric does **not** show 100 per cent. efficiency it is rejected.

The result is that RAYBESTOS not only outwears and outlasts every other lining, but gives a much greater coefficient of friction and offers the car owner a higher factor of safety than can be obtained in any other way.

RAYBESTOS
Is the Quality Lining of the Industry

Demand and insist upon getting Raybestos. Do not accept cheap imitations. The name "Raybestos" is stamped in every foot for your protection. Look for it

The Royal Equipment Co.,

450 Housatonic Avenue
BRIDGEPORT, CONN.

We also make Duplex and Raymond Brakes, and Gyrex, the Mixer.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

PRICE • LEADER

Positively Explodes All Established Motor Car Values

MCINTYRE 8-40 LIMITED

The Popular Self-Seller for 1913

THE AUTOMOBILE AGENT'S "DREAM COME TRUE."

A telegram will be none to swift to secure territory.

OUR OUTPUT WILL NOT SUPPLY EVERYBODY.

Good Influential Agents Wanted in all Open Territory.

Write or Wire Immediately for Attractive Agents' Proposition.

W. H. MCINTYRE CO.,

AUBURN, INDIANA, U. S. A.

VEHICLE BUILDERS FOR 43 YEARS.

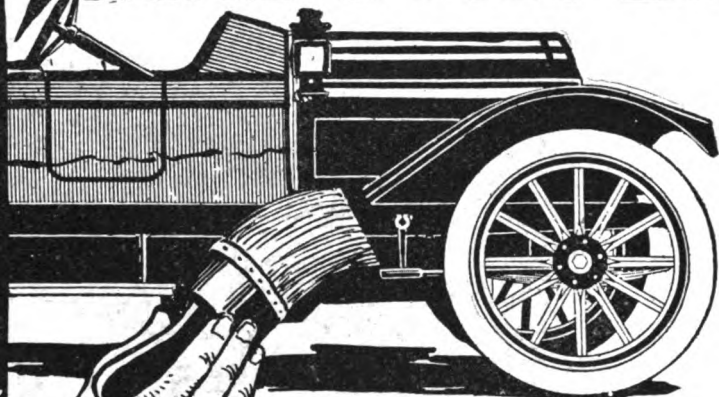
\$1485.00

SIX CYLINDERS
FORTY HORSE POWER
FOUR SPEEDS FORWARD
UNIT POWER PLANT
THREE POINT SUSPENSION
FULLY EQUIPPED



Please mention the Automobile Dealer and Repairer when writing to advertisers.

PAINT YOUR CAR YOURSELF!



**YOU CAN DO IT AND
SAVE \$25 to \$75**

**Any one can use our materials.
You don't need previous experience.**

ARSENAL VELVET GLOSS is the new dull finish for motor cars which has come to be so popular for roadsters, torpedo and toy tonneau cars, and is equally good for any car. It is in two coats

with the proper brush for application and will cover solidly over any previous color. Anyone can satisfactorily paint a car with Velvet Gloss by following the simple directions on the cans. Apply a coat to-day, another to-morrow, and use the car the third day. Then, in six months or a year, if your car looks a little shabby, simply give it another coat of Velvet Gloss. You can eliminate your painting bills by using Velvet Gloss.

ARSENAL VELVET GLOSS is made in the following colors: French Gray, Battleship Gray, Ebony Black and Apple Green, and in two sizes of outfits. No. 1, sufficient for cars like the Hupmobile, Ford, etc., costs \$5, and No. 2, for larger cars, costs \$7. Order an outfit to-day and paint your car yourself.

THE ARSENAL SYSTEM of repainting motor cars (for novices) should be used by those desiring a high gloss finish. It is in three coats ready mixed for use, together with proper brushes and full instructions. The Arsenal system is made in the following colors: Red, Maroon, Green, French Gray, Battleship Gray, Orange, Cream, Apple Green, Black, two shades of Blue, and Brown. There are three sizes of outfits: No. 1 for small runabouts, costing \$7; No. 2, for Model T Fords and small touring cars costing \$8, and No. 3, for large touring cars, costing \$9. If two colors are desired—that is, the body one color and the wheels another—add 75 cents to cost of each outfit. Hundreds of car owners have saved thousands of dollars by doing their own painting with the Arsenal system.

HOOD AND FENDER OUTFITS. A great many cars have the hoods and fenders enamelled black regardless of the body color of the car. We make outfits for this purpose in two coats and one color only, black. No. 1 outfit is \$2.75; No. 2 is \$3.75, and No. 3, \$5.00.

MOHAIR TOP DRESSING

ARSENAL MOHAIR TOP DRESSING is the most satisfactory dressing for Mohair on the market. One coat will renew the faded Mohair and stop the leaks. Price, quarts, \$1.50; pints, 80 cents.

ARSENAL BLACK ENAMEL TOP DRESSING is for leather and imitation leather, such as pantasote, etc. Is also a good leather dressing for black upholstery. Price, quarts, \$1.50; pints, 80 cents.

ARSENAL LEATHERNEW is a clear leather dressing for colored upholstery and is a good dressing for colored tops if of leather or imitation leather. Price, quarts \$1.50; pints 80 cents.

Enamelled Lamps the Style for 1913

ARSENAL LIQUID GUN METAL is the only air-drying brass enamel of **proven merit** on the market. It has **proven its worth** on thousands of cars during the past four year. **MADE IN BLACK, IF SO ORDERED.**

Arsenal Liquid Gun Metal is for sale by leading dealers everywhere, but if yours does not have it in stock, we will forward a can, express prepaid, on receipt of \$1 (in the U. S. only).

ARSENAL LIQUID SILVER will positively silver-plate brass or copper, quicker and with less labor than any similar material. From two to five minutes is all the time required. It is a satisfactory polish for nickel as well. Price, \$1.00. The popular style is enamelled lamps with silver-plated trimmings. A can of Liquid Gun Metal and a bottle of Liquid Silver, enables you to do over your brass in the prevailing style, and we will send both by prepaid express, for \$1.75.

Our booklet—"The Car Beautiful"—describes these materials in detail, and is the only work of its kind published. Send for it to-day. It is free.

ARSENAL VARNISH CO.,
2501 Fourth Avenue **ROCK ISLAND, ILL.**

Specialists for Motorists

TIRE PRESSURE GAUGES

An Important Announcement

A. SCHRADER'S SON, INC., manufacturers of the well-known Schrader Universal Tire Pressure Gauge, beg leave to announce to the trade that they have acquired the entire right, title and interest in and to the Twitchell Tire Gauge Patent No. 927,298 dated July 6, 1909.

In view of the acquisition of this patent, purchasers of the Schrader gauges are relieved from any possibility of suits for infringement under the Twitchell patent. The Schrader Gauge will continue to be the highest type of pencil gauge both with regard to accuracy and durability.

Realizing that there is a wide demand for the Twitchell gauges, we have empowered the Twitchell Gauge Company of Chicago to continue to supply the market with Twitchell gauges under the Twitchell patent, so that no question of infringement can arise with regard to the product of this concern.

The Allen Auto Specialty Company, manufacturing the Allen Tyrometer, has taken a license under the Twitchell patent, and the suit pending against this company has hence been withdrawn.

We believe that the acquisition of this patent by A. Schrader's Son, Inc., will clear up the gauge situation and relieve our friends of any feeling of uncertainty which they may possibly have had in the past. We also believe that with the Schrader Universal Tire Pressure Gauge, the Twitchell Gauge, and the Allen Tyrometer the field for gauges is fully covered and a variety is offered which allows an ample chance for selection from the different types.

No other gauge is licensed under the Twitchell patent, and hence to avoid any possibility of infringement our friends are asked to restrict their dealings to the three gauges above-mentioned.

The Twitchell patent has been sustained in several suits, and the following gauges have been held to be infringements thereof:

The Northam Gauge—held to be an infringement by the United States Circuit Court for the Southern District of California in the suit of Charles R. Twitchell vs. Northam Auto Pressure Gauge Company.

The Prest-O-Lite Gauge—held to be an infringement in the suit of Charles R. Twitchell vs. Prest-O-Lite Company in the Southern District of New York.

The Safety Tire Gauge—held to be an infringement by the Supreme Court of the District of Columbia in the suit of Charles R. Twitchell vs. Rudolph & West Company.

Furthermore, in the suit against the New York Sporting Goods Company the sale of the Edelmänn "Economy" gauge was enjoined. This decree was obtained by default, E. Edelmänn & Company of Chicago failing to defend its customer, as is usual. Following this, suit has been brought directly against E. Edelmänn & Company, which suit is now pending. All other dealers in infringing gauges will be promptly prosecuted.

In closing, we wish to assure the trade and consumer that in the future, as in the past, it will always be our endeavor to supply them a reliable gauge at a reasonable price and under satisfactory business conditions. Our gauges may be obtained from all tire manufacturers, jobbers, supply dealers and garages, or direct from us.

Retail price, \$1.00 each.

A. SCHRADER'S SON, Inc.

28-30-32-33 Rose Street

NEW YORK CITY

Every Car Owner Needs This Prime-r It Starts Any Motor on First Quarter Turn



Open needle valve slightly (you needn't remove glove) and inject gasoline. Passing through its own channel to plug base, it vaporizes directly at spark points.

Mr. Dealer, you know that there are thousands of cars which cannot be started in cold weather without priming.

Champion Priming Plugs are absolute winter necessities on cars without priming cocks, and they are often wanted badly on cars that have such devices.

Champion Priming Plugs---new this season---splendidly supplement our standard line, which already is regular equipment on 60 per cent. of the automobiles in America.

Champion Priming Plugs, devised to fill a special field, have no rival in point of efficiency or workmanship.

Priming is readily done---just turn needle valve back a few threads by hand; inject a few drops of gasoline and close again without removing your gloves.

Champion Priming Plugs are both sure and safe, because, as will be seen by the illustration, they create vaporization right beside the spark points.

Priming cocks cannot be placed in as advantageous a position, yet the gasoline is kept away from the porcelain so that it cannot "soot-up".

Gasoline flows down to the plug base in its own channel; a shell of steel separates it from the porcelain and the electrodes.

You can run with the needle valve open without danger to the porcelain from a hot exhaust blast.

FOR SALE EVERYWHERE AT \$1.25 PER PLUG.

Trial Set of Four Champion Priming Plugs, Fully Guaranteed, Prepaid to Any Car Owner For \$5. Give Name of Car and Year of Make---Also Name of Your Dealer.

All jobbers and most dealers are already supplied. Write today. Liberal trade discount to dealers. Be ready to supply your trade in advance of our big advertising campaign in the great national weeklies.

CHAMPION SPARK

112 UPTON AVE.



PLUG COMPANY,

TOLEDO, OHIO

Prest-O-Starter

Starts your engine (old or new) quickly and easily in coldest weather

FOR FOUR CYLINDERS, \$20
FOR SIX CYLINDERS, \$25

\$1.50 extra for two-way valve necessary when the same tank is used for both starting and stopping.

Here's a starter that adds practically no weight to your car, is perfectly simple and is as durable as the engine itself. Easily applied to any engine, old or new, very economical in the use of gas, and requires no expert repairing.

How Prest-O-Starter Works

The principle of starting a motor with Prest-O-Starter is the same as "starting on compression." A measure of acetylene, at low pressure, is pumped from your Prest-O-Lite Tank into the cylinders.

Touch your spark—your engine starts.

Unlike "gasoline priming" it is not affected by heat or cold. It is certain.

In cool weather, by opening a valve on the dash, you can feed gas at low pressure into the intake manifold. This allows your engine to run on acetylene until it is warm enough to run on gasoline.

If the Prest-O-Starter did no more than prime your engine in this way during cold weather, this convenience would be well worth the price.

But Prest-O-Starter is more than a primer. When installed properly, it will start your engine, summer or winter, almost invariably without recourse to the crank.

Make Sure Your Starter is Installed CORRECTLY. Look it over!

The Prest-O-Starter is easy to install correctly. In fact, it's so very easy to install that some good factories and

garages install it with utter carelessness, overlooking the one or two simple features vital to success in operation. Fortunately this is an easy matter for the car owner to correct, even if he isn't a mechanic.

Our literature tells you exactly how the Prest-O-Starter is installed, and how to adjust it. Anyone can give it the slight attention it may need or quickly tell a dealer where the trouble lies.

Every Prest-O-Starter is sold with the assurance of satisfactory service. The entire Prest-O-Lite Organization is back of every one. If you have any trouble, report it to us or to our nearest branch. We'll wipe it out quickly.

Insist Upon GETTING the Outfit COMPLETE

During warm weather the connection which feeds acetylene into the intake manifold is not needed. So some dealers are not installing it. But in cold weather this feature is vital. You're entitled to it. It's included in the price, so see that you get it.

Now More Than Ever You Need One

Your Prest-O-Starter, properly installed, will average better than 95 starts out of 100 attempts. The few failures are caused by your motor stopping on dead center, or cylinders filled with burnt gas. Both of these conditions can be easily avoided when stopping your motor. But should either or both happen, an eighth or quarter turn of the crank, with the switch at neutral, will remedy the trouble at once, with all of the danger and labor of cranking eliminated.

Rest assured that no other starter can give you as high efficiency with as great economy, durability and freedom from mechanical trouble. The price is within easy reach.

Get in touch with any of our branches—or your dealer—or write us for descriptive literature.

The Prest-O-Lite Co.

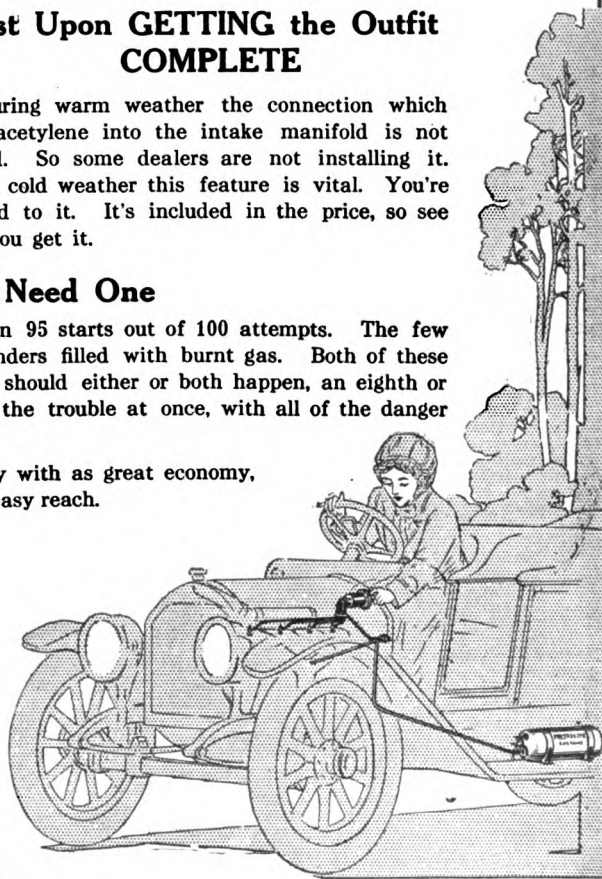
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Indianapolis, Ind.

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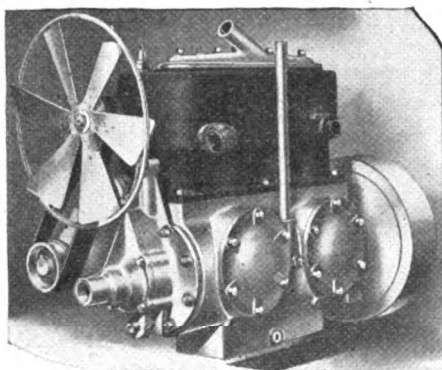
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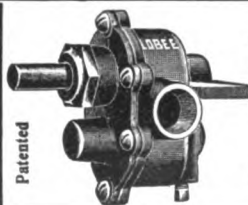
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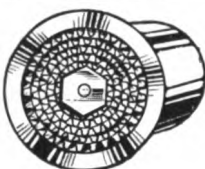
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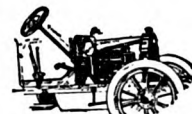
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Push and Cord
6/10 ampere at
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Spun Brass Projector, 9 in. long.
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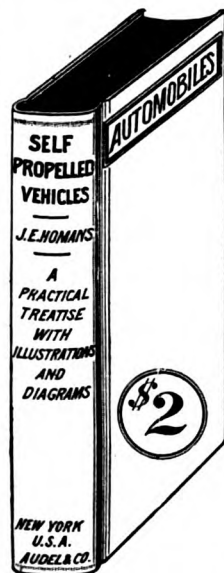
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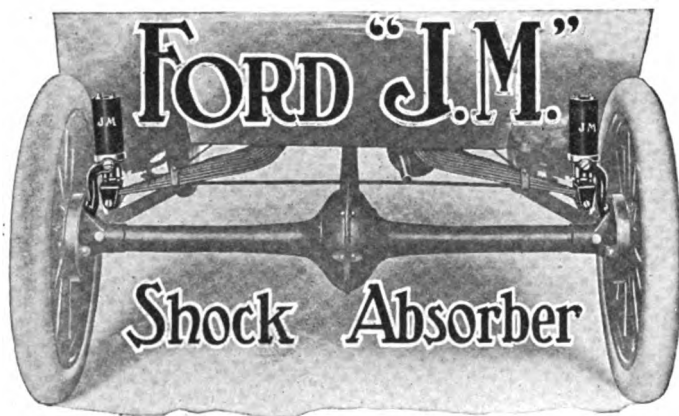
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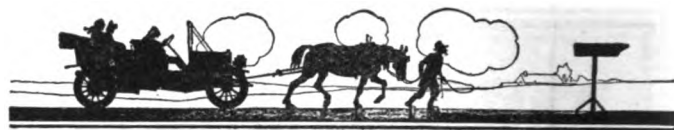
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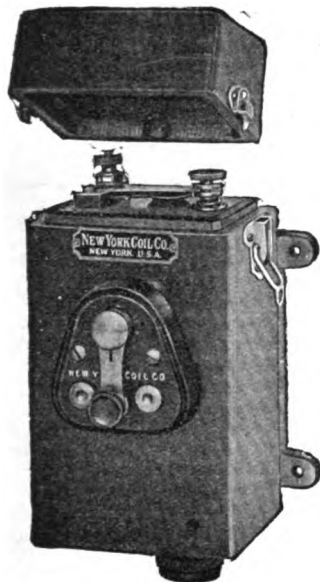
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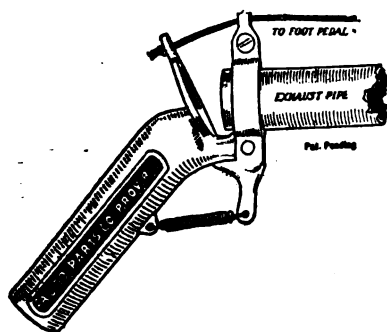
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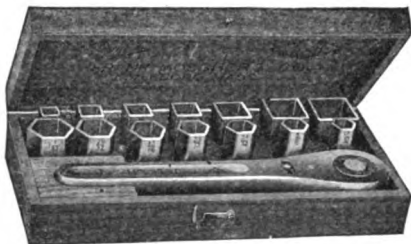
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This New Ratchet Wrench

Is surely a wonderful improvement over the previous socket-wrench handles.



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Socket Wrenches could try

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It's a Reliable Self Starter and this Reduction Appeals to you, act quick.
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Gilmer Tire Repair Pliers

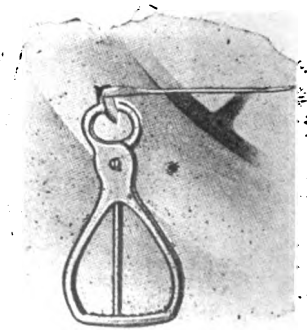
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Price of PLIERS (nickel-plated) with combination cleaner and cotter pin hook together, \$1.00. Complete satisfaction is guaranteed. A copy of "Tire Insurance" will tell you how to cut Tire Expense, and it's free.

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It cleans, polishes and protects the finish.
Does not leave a greasy surface.
Easy and convenient to use.

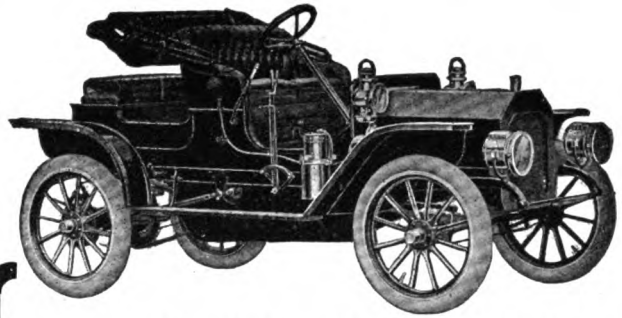
A few drops of Golden Star Polish used on the dust cloth and your car looks bright, clean and new.

Free Sample

Let us prove (without cost to you) the merits of Golden Star, "The World's Best Cleaner and Polisher." Ask your dealer for a free sample or write us and it will be sent you at once.

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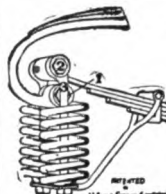
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St. Louis Supplementary Spiral Springs
For Comfort, Economy, Safety, Speed.

Tell us the name of your car, model, year and approximate weight. We will advise you the proper size and style to use and what they will cost you. Write today for Catalog. Distributors of the famous Hoffecker Speedometer.

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are the easy riding kind that end puncture and blow-out troubles. Guaranteed 10,000 miles, two years. Fit any standard clincher, universal, quick-detachable or demountable rim.

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Factories and Executive Offices: AKRON, OHIO.
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Hawthorne Pennant Holders

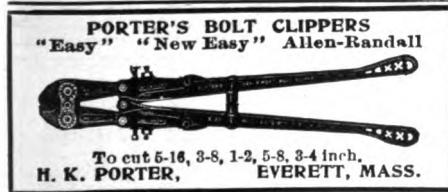
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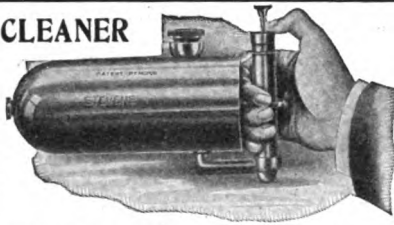
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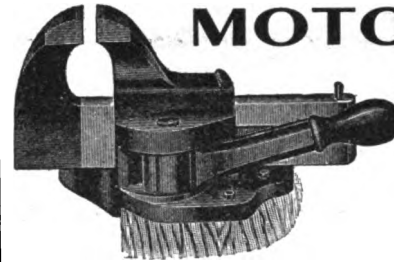
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Adopted by RALPH DePALMA, Winner of the Vanderbilt Cup at Milwaukee, 1912. Can be attached instantly without expense to any inner tube stem, on any car. Saves one-half the time and labor necessary to inflate tires by any other method. Easily adjusted. Warranted not to leak. 200,000 in use. Send \$1.00 for set of four. Try them 30 days, and if not satisfactory, money will be cheerfully refunded.

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What Is It?

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"THE LIGHT UNIVERSAL"

"In Exchange for your empty tank, accept only a genuine Prest-O-Lite Tank, filled with genuine Prest-O-Lite Gas."

This is the message that is going to Prest-O-Lite users everywhere.

In it there is a hint for the wise dealer, as well.

You know that no imitator of the Prest-O-Lite Tank has ever successfully imitated Prest-O-Lite Service.

You also know that no imitator ever made good the large claim "more gas and better gas than Prest-O-Lite."

So does your customer.

Imitations are getting harder and harder to sell. There are now mighty few dealers trying it.

Most of those who yielded to the old but ever tempting claim, "More Profits," have come back home.

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perhaps because he has money tied up in them, we can only say:

"The sooner you resume earning your good old Prest-O-Lite profit, the sooner you will make your income what it used to be."

The Prest-O-Lite Company, 251 East South St. Indianapolis, Ind.

Branch offices and Service Stations in all principal cities.
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**ELECTRIC and OXY-
ACETYLENE WELDING**

**of all Broken Parts
ALUMINUM CASES
AND CRACKED
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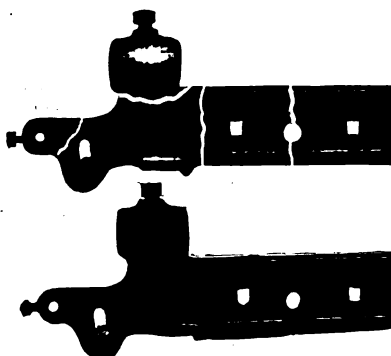
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NOW IS THE TIME TO GET YOUR

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Write for Guide Books No. 1 and No. 2.

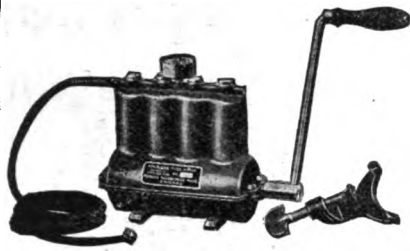
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THE PEERLESS FOUR CYLINDER TIRE PUMP HAND-ENGINE AND ELECTRIC DRIVEN



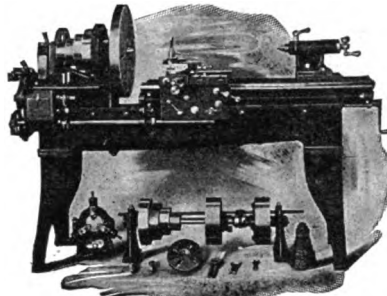
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1924-1923 Wabash Avenue, Chicago, Ill.

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This Lathe swings 14 1/4 in. over top bed, 24 in. through gap, and the gap opens 18 in. and 36 in. wide. Has 2-16/16 in. spindle with 1-9/16 in. hole thru same. Six quick changes of Geared Feeds, four Step Cone of large diameters.

The 5 1/4 ft. bed takes up to 64 in. between centers, while our 7 1/4 ft. machine takes 96 in. between centers when extended.

Just the thing for garage and repair work, and saves investing in a large expensive lathe.

Machine is built strong, rigid and accurate, and can be furnished with taper attachment.

Write for Latest Bulletin and Attractive Prices.

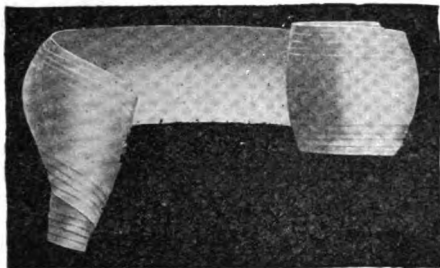
Barnes Drill Co., Inc., 1907,

Builders of the All Geared Drill.

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Put them in your tires *now* and you will get from one to four thousand miles extra service.



American Tire Protectors are made of strong, long-staple fabric. Will withstand continual hard usage and always remain flexible. Cured with our 5-Minute-Cure Vulcanizing Cement, hence heat-proof and layers cannot separate.

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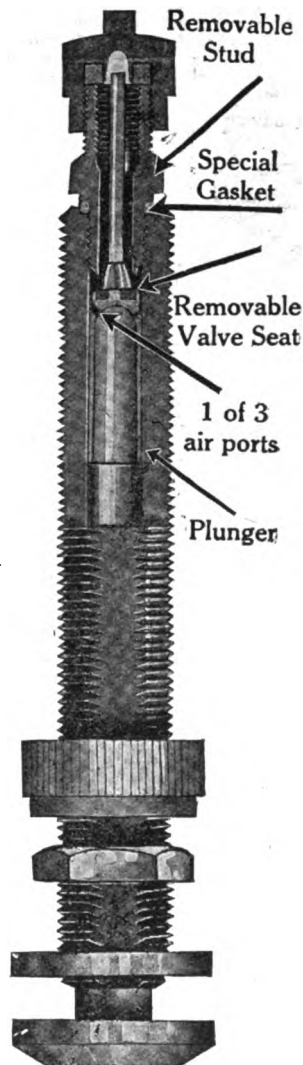
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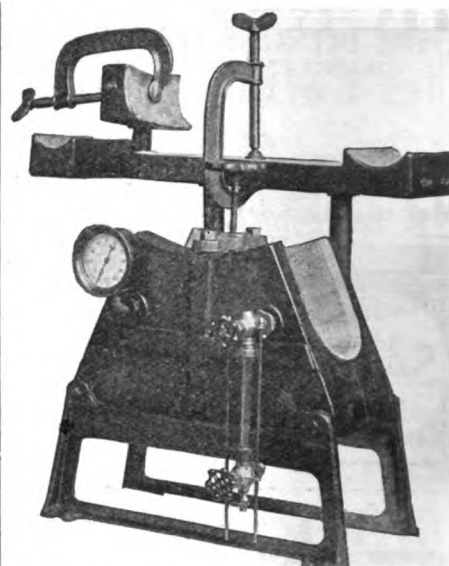
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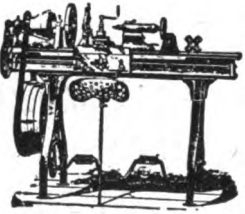


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Motor cars and boats frequently catch fire and blow up.

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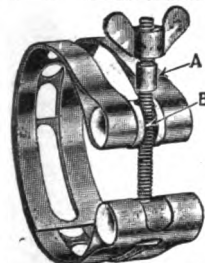
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Nothing has ever been created in this line comparable with it. This clamp can be attached or detached in a few seconds. It cannot slip, loosen, or cut the hose, and its strength, owing to its construction of band metal, and the way the ends are overlapped, is simply a perfect clamp, and the price is very low. Let us tell you more about it, or if you are an automobile manufacturer or dealer, let us send you one for inspection.

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Will remove mud, grease and dust, and spots of all kinds. When applied, the Rapid Auto Cleaner and Polish dries quickly, by rubbing the surface with a dry, soft cloth. It leaves the surface free from moisture, gum, grease, or soil of any sort which will stick to the hands or clothes. It can be applied to any surface without fear of damaging the same.

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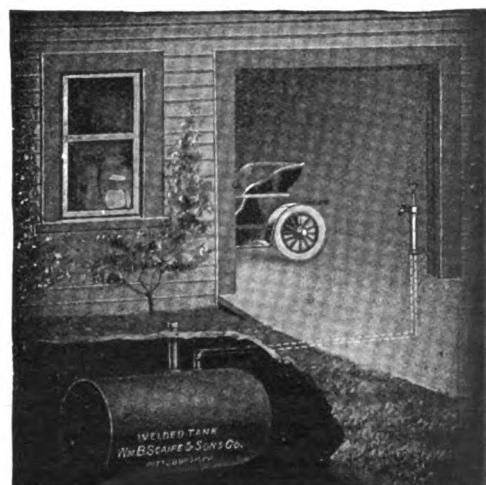
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Because the Master Vibrator does a great deal more than simply replace the four separate vibrators on a coil. It is NOT A VIBRATOR in the ordinary sense but a scientifically constructed MAGNETIC CIRCUIT BREAKER which times the spark more accurately than the ordinary High Tension Magneto.


It is so designed as to utilize the alternating current of the Ford Magneto and make the coil produce a MUCH HOTTER SPARK than it could produce with any other vibrator.

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LARGER CONTACT POINTS and handsome switch. INCREASED SATISFACTION with your car. EASILY PUT ON IN HALF AN HOUR, no changes in car necessary.

PRICE, \$15.00. Express prepaid if cash accompanies the order. Order from us or through your dealer. We are the originators and were the first to make and market a Master Vibrator. Insist on seeing the trade-mark and be protected in the original and only genuine time-tested and guaranteed Master Vibrator.

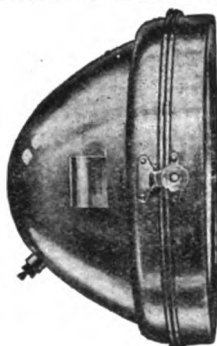
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The New ELECTRIC HEAD LIGHT OUTFIT \$35.00

Complete Electric Headlights FOR FORD CARS \$15.00

With Fly-Wheel Magneto

Choice of Either Straight Body or Bullet Shaped Lamps



The successor to the gas tank. Current direct from Magneto.

The K-W Outfits manufactured for this purpose are not makeshifts, but are complete in every detail.

The Outfit Complete, which is all you need, consists of

- 1 pair complete Head Lamps.
- 2 Tungsten bulbs, 2-1/16" in diameter.
- 12 feet wire, all soldered to lamps.
- 1 Lighting Switch.
- Instruction Sheet for Wiring.

The Lamps are made entirely of one piece of brass drawn from steel dies; have no soldered joints, easy to polish, and make a handsome lamp for the Ford cars. They fit the forks furnished on the Ford cars.

SPECIAL OUTFIT DE LUXE

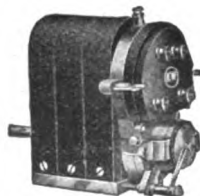
For those who want something "extra swell" or "classy" for the touring car, we can furnish, if desired, a 9" bullet shaped lamp which also fits the prop furnished on Ford cars. Price \$17.00.

The regular 8" lamp is, however, as large as required to catch all of the rays and throw all of them forward, and a larger lamp than this is merely for looks. For black finishing add \$1.00 to price of either outfit.

The K-W High-Tension Magneto

For all cars having provision for Magneto

Model J
Guaranteed
to start
auto
Engines up
to 30 H. P.



No Coil
No Timer
No
Batteries
4 Cyl., \$50
6 Cyl., \$55

We make larger Magnetos for larger engines. High Tension Magnetos are for Ignition use only. Use Low Tension for lights. If you cannot gear-drive a High-Tension Magneto, use one of our Low Tension belt or friction-drive Magnetos and a K-W Spark Coil.

Complete Outfit; generator, headlamps, switch, wire and bulbs.

Easy to install on any car with exposed fly-wheel.

No storage battery required.

No complicated cut-out nor charging device.

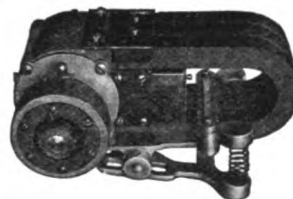
CURRENT DIRECT FROM GENERATOR.

Weight only 18 lbs. Compare this with the heavy, complicated and costly charging outfits.

MORE LIGHT AND BETTER LIGHT.

Let us describe it fully.

The Lighting Special Generator



The New Model LS Generator, \$20.00. Complete Lamps, \$15.00

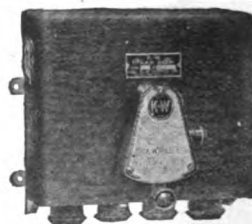
The Model LS K-W Generator has one magnet less than our regular Model UL \$35.00 Magneto, and is just like it in every way except that the Model LS is slightly smaller. Model LS will light two 2 1/2-Ampere bulbs (two sixteen candle power bulbs).

This Generator embodies the well-known K-W construction, having no commutator, no brushes, and no sliding contacts, the only moving part being the rotor, which swings perfectly free, supported on high duty ball bearings.

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Single Cylinder	\$12.00
2-Cylinder	18.00
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\$3.00 Button Tire Cover given away with every purchase of tires. These tire covers are guaranteed water-proof and dust-proof and will be furnished in any size.

Highest grade stock, comprising of the best manufacturers. Cannot advertise names on account of the reduced prices we are selling them at.

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These are not the kind usually advertised. Nothing but the best stock is quoted in this ad.

Casings to fit Clinchers, Quick Detachable or Dunlop Straight Side Tires.

Size	Casing	Tube	Size	Casing	Tube
28x3	\$9.50	\$2.50	35x4	\$22.00	\$5.25
30x3	10.75	2.75	36x4	19.50	5.40
32x3	10.50	3.00	37x4	22.50	5.75
28x3½	12.00	3.00	32x4½	20.00	5.50
29x3½	14.50	3.15	33x4½	23.00	5.60
30x3½	14.50	3.75	34x4½	23.50	5.75
31x3½	15.00	3.75	35x4½	24.50	6.00
32x3½	15.00	3.90	36x4½	25.00	6.10
34x3½	15.75	4.15	37x4½	25.00	6.20
36x3½	15.00	4.25	34x5	20.00	6.00
30x4	16.50	4.60	35x5	25.50	6.25
31x4	17.00	4.75	36x5	26.00	6.50
32x4	17.50	4.90	37x5	28.00	6.75
33x4	19.00	5.00	37x5½	30.00	7.00
34x4	19.50	5.10			

Take advantage of these prices and free offer, as we cannot guarantee how long these prices will stand good.

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We agree to refund your money if goods are found unsatisfactory upon receipt.

We Ship Goods Subject to Examination.

INSIDE TIRE PROTECTORS.



Prevent blow-outs, punctures, and greatly increase mileage. These tire protectors are made from 3 to 6 ply of Egyptian fabric, with a self-seal flap reinforcing the rim and sides, always the weakest parts. Tube pinches are eliminated by the use of these protectors.

Order a complete set of them and save 100% on your tire expense.

Size	Reg. Price	Cut Price	Size	Reg. Price	Cut Price
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30x3	4.90	2.85	32x4½	7.25	5.00
30x3½	5.25	3.35	34x4½	7.50	5.10
32x3½	5.50	3.55	35x4½	7.60	5.25
34x3½	5.75	3.95	36x4½	8.00	5.50
30x4	6.20	3.75	34x5	8.10	5.60
31x4	6.35	4.00	35x5	8.27	5.75
32x4	6.40	4.20	36x5	8.50	6.00
33x4	6.60	4.40	37x5	9.00	6.50
34x4	6.75	4.75	37x5½	9.25	6.75

Owing to the fact that our profits are very small, we sell for cash only, and under no circumstances otherwise.

C. O. D. orders filled if 10% is accompanied with order, to show good faith.

Send for complete list.

EXCELSIOR TIRE CO.,

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Are worn-out casings worthless? Are blown-out tires fit for the scrap heap only? Not when you know the Triple Tread.

With that tread-worn tire of yours as a foundation, we can build you a **puncture proof** and **non-skid** casing, which, more likely than not, will give you from 1000 to 2000 miles **more service** than your tire would be good for if **brand new**.

Quick service—guaranteed results—and moderate cost! Sounds too good to be true—but—well, just drop us a postal and get the facts in full. Find out today in what way the Triple Tread actually makes an old tire better than new, and how it

Cuts Chunks from your Tire Bills.

French Chrome leather—tough, water-proof and wear resisting—studded with hardened steel studs on the tread, and flat-headed rivets around the sides—three-ply where the wear is greatest that's the Triple Tread.

This stout, tough, practically wear-proof shield is built onto the worn rubber casing—not riveted on—not laced on—but inseparately united with it by means of our **Steam Heating Vulcanizing Process**, made into one solid, wear-fighting unit, with no patchy-looking outer layers to creep or heat.

The Triple Tread is a clean-cut success, Mr. Motorist. Will you risk a postal card against our say-so that it's mighty good business to get posted?

TRIPLE TREAD MFG. CO.

1542 Michigan Avenue

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NEW APRIL STANDARD LIST.

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CLINCHERS, DUNLOPS and Q. D. CLINCHERS & TUBES.

Size	Our Unguaranteed	Our Guaranteed	Tubes
28 x 3	\$8.82	\$10.71	\$2.13
30 x 3	9.45	11.48	2.28
30 x 3½	18.90	16.87	3.09
32 x 3½	14.84	18.02	3.25
34 x 3½	16.14	19.59	3.46
30 x 4	19.04	23.12	4.00
32 x 4	20.48	24.86	4.21
34 x 4	21.91	26.61	4.46
36 x 4	23.85	28.85	4.69
34 x 4½	27.76	33.70	5.52
36 x 4½	29.44	35.74	5.81
36 x 5	36.16	43.90	6.81
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"INDEPENDENT" guaranteed tubes, 30% off. Q. D. FLAPS, free.

Goods shipped with examination privilege. Money refunded on goods returned intact within a week.

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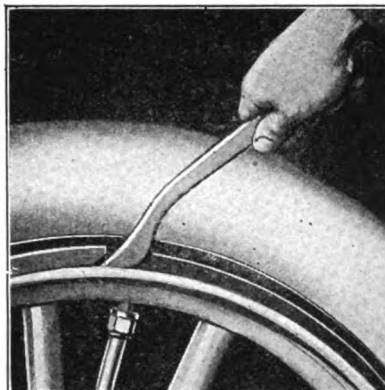
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An indispensable tool to those who own one. One downward motion of RIM REMOVER is all that is necessary.

First half of downward motion forces inside rim back and locks rim remover, and remaining downward motion releases outside rim.

So simple, so easily worked, the Rim is released in thirty seconds. Made of tempered steel, durable, and always ready for instant use. Positively saves time and temper. Order today—you may need one tomorrow.

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If your dealer cannot supply you, order direct from us.

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PERFECTION MANUFACTURING CO.

Patentees and Sole Manufacturers,

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AUTOMATIC IN ACTION SAGER SHOCK ABSORBERS

Have proven for seven years to be mechanically correct. Prevent recoil and bumping of springs; thereby reducing car maintenance to a minimum.

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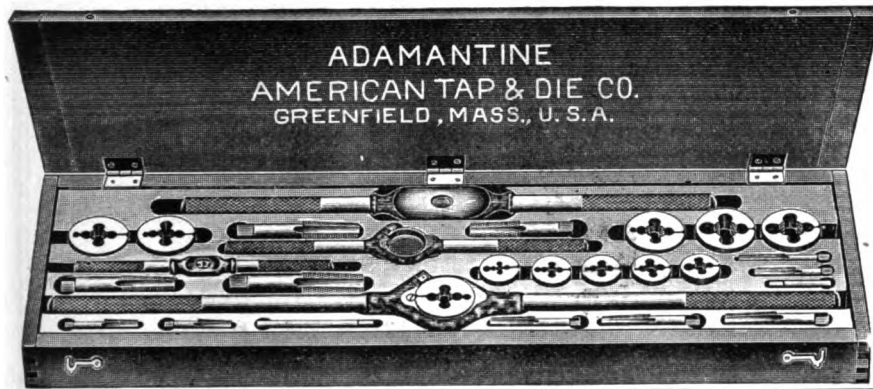
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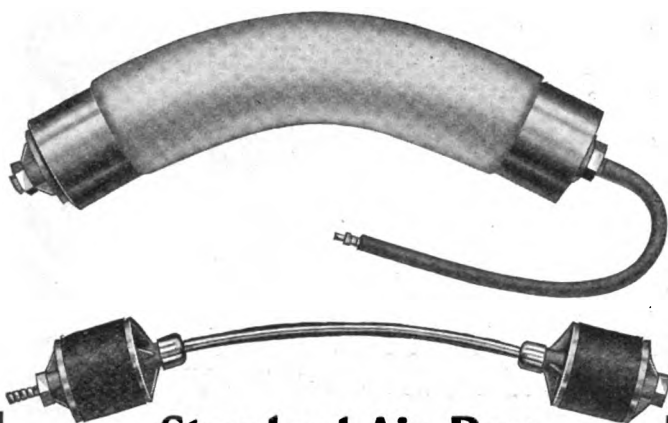
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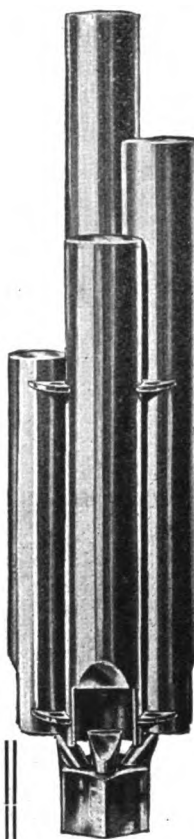
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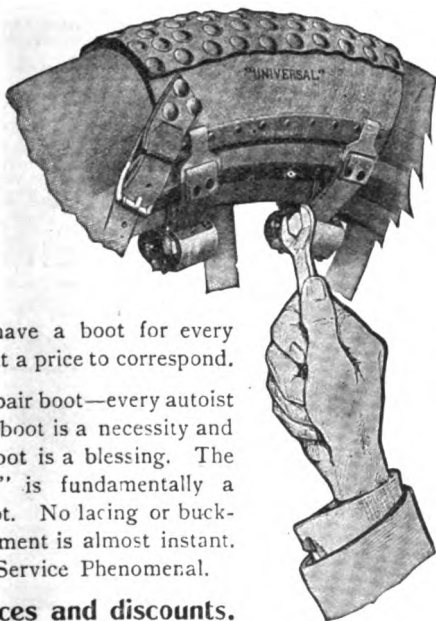
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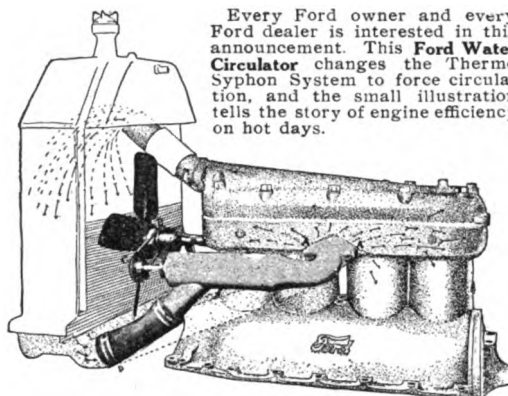
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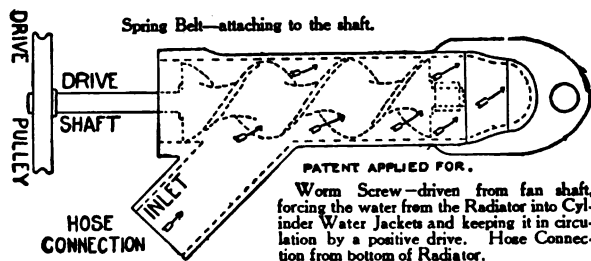
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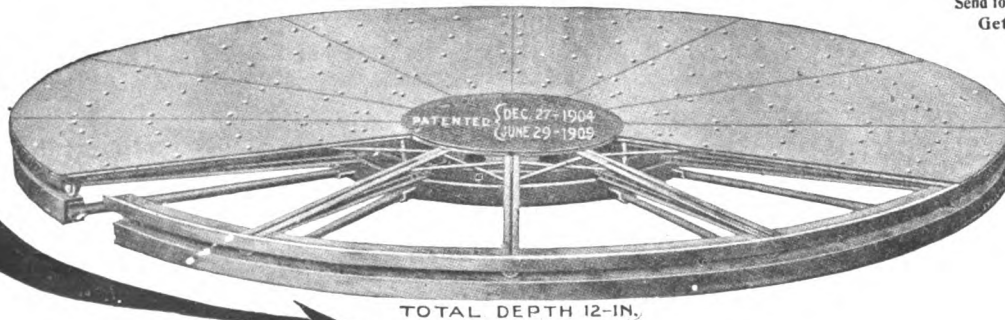
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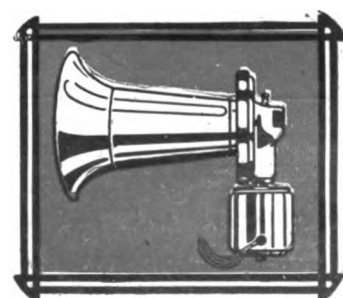


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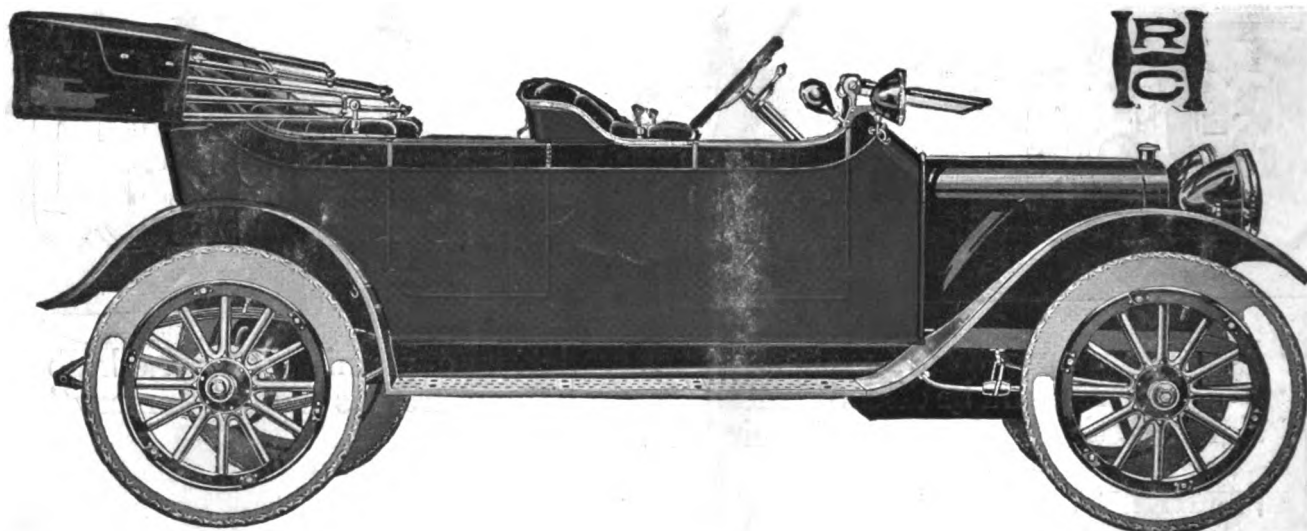
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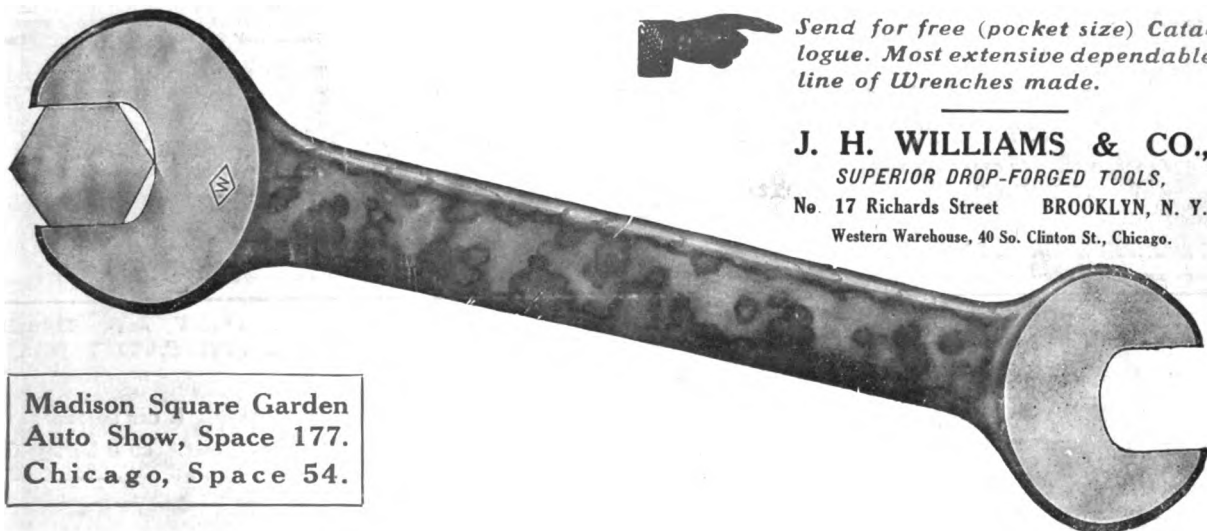
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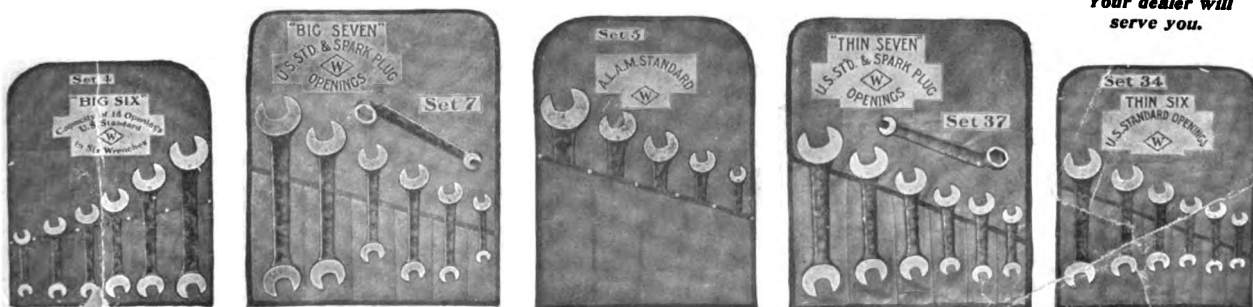
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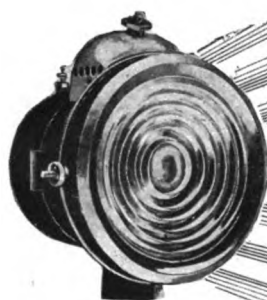
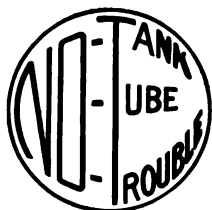
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Automobile Headlights

With Alcohol (obtainable anywhere), as Fuel.

ONE CENT AN HOUR is the actual cost of operation. This remarkable saving over the old lighting methods quickly pays the cost of the entire equipment. No tanks or recharging of tanks are necessary. Simply pour alcohol in the SELF CONTAINED headlights, which require no outside connections or the operation of lighting, or keeping a light. The headlights can be lifted off the brackets and its light flashed in any direction. Very helpful in case of a breakdown or any emergency.

The headlights are beautifully designed, the quality and workmanship being absolutely of the best. The light is white and mellow, powerful in rays, having a throw of 600 feet and a spread of 250 feet, with unimpaired intensity, lighting both corners when turning.

If we are not represented in your locality at present, send us your order—we will ship direct.

BUTYLITE HEADLIGHTS, 7-inch Size, Complete, \$35.00 Per Pair, F. O. B. New York.

Agents wanted in every city and town.

Dealers discounts supplied upon application.

Write for Free Catalog.

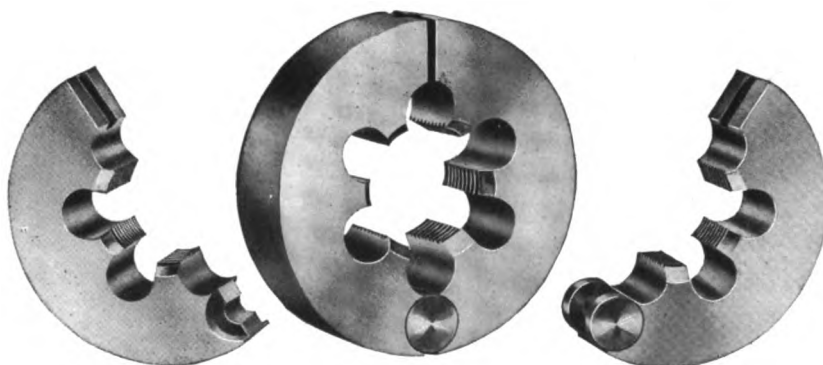
"BUTYLITE"
(Beauty Light)

32 UNION SQUARE, EAST, Dept. A.

NEW YORK CITY

EMINGTON (2 PART) DIE WILL PUT AN END TO YOUR THREAD TROUBLES

only Adjustable Die
on the Market
Adjustable to Exact
Working Threads
and
Guaranteed to Maintain
the Correct Size
its Whole Life



It can be Sharpened same
as a Milling Cutter

It will Outwear at Least
Six Ordinary Dies

The Teeth are Keen and
Free Cutting when new
and can be kept so as
long as the Die lasts

DGAR T. WARD & SONS, Small Tool Department, 25 Purchase Street, Boston, Mass.

BOLLEE LAUTH-JUERGENS RANDOLPH SEAGRAVE KISSEL GRAND RAPIDS SCHNEIDER KINNEAR PEERLESS RENAULT

BALL BEARINGS

"INSURANCE FOR BUILDER AND USER"
RHINELAND MACHINE WORKS CO

140 WEST 42nd ST.

NEW YORK, N.Y.

GEHRDTER STOEGER ARIES KELLY NAGANT PANHARD PEUGEOT DELAHAYE MACK DE DIETRICH AUTO-METALLURGIQUE

HISPANO-SUIZA



Section of Double Grip Woodworth Treads showing special high rivets.

AT LAST

**You Can Defy Snow and Ice
Without Resort to Chains!**

The chain nuisance has been tolerated from its supposed necessity. You use chains when you must, and avoid them when you can. At best, they are noisy, short-lived, and expensive.

You can avoid the nuisance, drive anywhere without skidding, and **save money** by using the new

Double Grip *Woodworth Treads*

Just put them on with the first snowfall and keep them on through the winter. Their special high rivets, cupped and hardened, and spaced two inches apart, give a hold on ice or in snow. The regular rivets help, too.

Punctures and roadside tire troubles are eliminated—and this means something in cold weather!

Best of all, the Double Grip Treads are not an added expense like chains—they **pay for themselves** in the added life of the tires. New tires, protected by Woodworth Treads, are good for twice or thrice their mileage when run bare.

Don't wait till your chains have worn out and cut your tires! Save the tires—they are worth it.

Write today, to us or to our nearest distributor, stating your tire sizes.

Leather Tire Goods Company

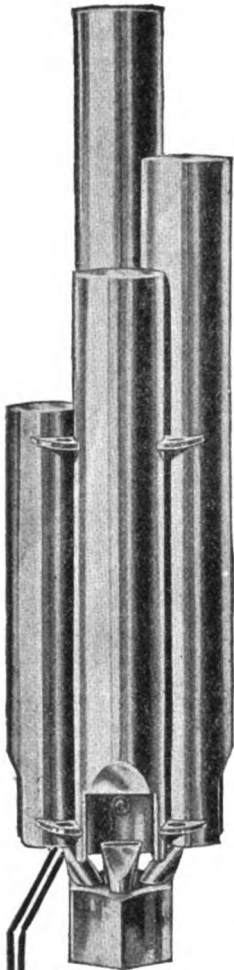
Niagara Falls, N. Y.

NEW YORK STORE, 1608 Broadway.

Good Agents Wanted for Unoccupied Territory

Please mention the Automobile Dealer and Repairer when writing to advertisers.





Patented
Jan. 23, 1912
Aug. 20, 1912

Let Me Demonstrate This Musical Auto Horn to You

—G. V. P. LANSING

I want you to hear its courteous, chime-like signal. I can't tell you in words just how the Aermore Horn sounds. The nearest I can come to it is to say that "It sings like an organ," and you can hear it a block or a mile away. So I want you to listen to its melodious tone, produced by four different notes sounded simultaneously. Write me

for full particulars about this special offer.

The **AERMORE**
Exhaust Horn

— the horn harmonious.

It's the only exhaust horn that *can't* clog—it's self cleaning. You can attach it to the exhaust pipe in a few minutes. No up-keep cost. Made in four sizes for different horsepower engines. Prices \$7.50 to \$12.00.

Write Me Today for Literature

Drop me a line for my special offer to demonstrate the Aermore to you.

I want you to confirm Mr. Fulton's judgment. He says: "It's a peach." I'll also send you descriptive literature. Don't fail to write me at once. Just a postal will do.

G. V. P. LANSING, Pres.

Aermore Mfg. Co.

Department 5549

1536 Michigan Blvd. Chicago, U.S.A.

SPECIAL TO ADVERTISERS

Our next Regular Issue (January Number, 1913,) will be the Annual

CHICAGO SHOW NUMBER
of Automobile Dealer and Repairer

Guaranteed Circulation

32,000 Copies

This issue will be mailed to all our regular subscribers, whether CAR OWNERS, DEALERS, GARAGE OWNERS or REPAIR MEN, in ample season for you to make Chicago Show announcements.

In addition this number will be extensively distributed to exhibitors at the Chicago Automobile Show; and we shall exhibit and demonstrate this publication and receive subscriptions in our space at this Show.

To be included in this great Special Number, we must have your order with copy **immediately**. Do not neglect the matter and lose this exceptional advertising opportunity.

FIRST FORMS CLOSE JANUARY 2d, 1913

No advertising for Chicago Show Number can be accepted after January 5th, 1913.

We give you the benefit of

LOWEST YEARLY RATES

for space in this Number.

The best way for you to secure space is to wire your order, telegraphic charges at our expense.

DO IT NOW

or you may be too late.

Address telegrams or other communications to

MOTOR VEHICLE PUB. CO.,
71-73 Murray Street, NEW YORK CITY

Guaranteed 5000 Miles Without Puncture

Even Over the Roughest Frozen Roads

Your tire expenses this winter will be tremendous. Icy, frozen roads will cut and puncture them if they are not protected by **Durable Treads**.

If your tires are protected by **Durable Treads** you can travel over the most disastrous frozen roads, with never a fear of puncture, cut or blow-out. You will experience no unpleasant road delays—your tire bills will vanish.

On slippery pavements—in crowded streets—you can control your car. For there will be no slipping or skidding with **Durable Treads**. There will be no need for ruinous, inconvenient chains.

Our Written Guarantee

With **Durable Treads** we will give you a written legal guarantee for 5000 miles without puncture. This is binding whether your tires are new or old, tread-worn, rim-cut or rut-worn.

This means that for 5000 miles, over any sort of roads, your tires cannot puncture, blow-out or become injured.

Durable Treads are the only treads built to protect your tires against rim-cuts, rut-wear and side blow-outs.

The full leather cover prevents gravel and sand from entering, to grind and wear the tire.

With **Durable Treads** the resilience of your tires is just as great—high speed just as easy—cost of gasoline no more.

This is perhaps the most liberal guarantee ever given with a tread. Read it over again! Get its full meaning to you! Figure out what it will save you each season.

We are able to give you this guarantee in black and white—binding—bona fide—because **Durable Treads** every day, on thousands of cars, are proving that they can make good. This is because **Durable Treads** are different, absolutely, from all others.

Your Annual Problem Solved

Each season you are face to face with the same old problem—new tires. Each season you must pay \$50 to \$200 for a new set.

But this problem can be solved through **Durable Treads** at half the cost of tires. If your tires are now worth keeping—unless they are shot to pieces—**Durable Treads** will make them wear 5000 miles more without puncture.

So do not abuse them another day—do not run them unprotected until they are useless—or you'll throw away \$50 to \$200.

If your tires are new, **Durable Treads** will save them—give you three seasons wear instead of one.

Construction

1.—Extra heavy tread strip covers wearing surfaces, adding 50% to the life of protector.

2.—Three to five plies of live fabric prevents stretching or sagging.

3.—Hardened Steel Rivets, closely set on tread surfaces, prevents skidding.

Durable Treads

Construction

4.—Full leather cover protects tire against ruts and blow-outs.

5.—Nickel Steel Rim attachment places driving strain on wheel, instead of on worn, weakened tire. It also prevents rim-cuts and blow-outs.

Tire Expense Reduced Half

Your tire expense is now actually 1½ to 4 cents per mile. It is greater than that of gasoline and oil combined. Yet it can be eliminated through **Durable Treads**.

For with **Durable Treads** punctures, blow-outs and tire repairs will be eliminated.

If you'll stop to figure out what that means, you'll find that you spend enough on repairs alone each season to almost maintain your car.

Forcing Recognition!

Every day the list of **Durable Treads** converts are growing. And only because **Durable Treads**, through their remarkable advantages—are forcing that recognition.

Car owners are awakening to the fact that they can save that 1½ to 4 cents per mile.

The cry we have always heard about tire expense is becoming fainter.

This season our sales are doubling month by month. For our owners now realize that **Durable Treads** are not an experiment, but a proven quantity—a most vital factor in automobile construction. They should soon become part of the standard equipment.

Cost Half Of Tires

A set of tires costs \$50 to \$200. But **Durable Treads** cost less than half that. Hence, isn't it more economical to protect these costly, delicate tires?

Isn't it more economical to buy **Durable Treads**, at half the cost of tires, than to buy new tires each season? **Durable Treads** are a leather and canvas cover—studded with steel rivets—that covers the entire tire, just as it stands on your car.

Test At Our Expense

We want you to know just what **Durable Treads** are before you invest a cent or promise to buy.

We will ship you a pair or full set, with your permission, for inspection. We pay all express charges—you are not put to a cent's expense, obligation or trouble.

You make no promises to buy.

After you examine **Durable Treads**, if you are not satisfied that they will do all we claim, return them. This examination will cost you nothing.

Special Discount

If **Durable Treads** are not already represented in your territory, we will make shipment to you direct from the factory and allow you our full dealers' discount on your initial order.

This is merely to introduce them. It is an excellent opportunity for you to equip your car at almost cost.

It must be taken advantage of immediately, for the inquiries and orders each day are rapidly filling all territories.

Send Coupon For Facts

We have explained to you without exaggeration just what **Durable Treads** will do! We have shown you how to save \$50 to \$200 each season.

Now we want you to send the coupon to us at once for copy of our legal guarantee and other conclusive proofs.

We will send you a sample of **Durable Treads** leather. If you can rip it, you must be unusually strong. Simply fill in and mail the coupon—but be quick!

If you live west of the Mississippi, address our Denver Office; if east, address Chicago.

COLORADO TIRE & LEATHER CO., 1208 Majestic Bldg., Chicago, Ill.; 1027 Broadway, Denver, Colo.

COLORADO TIRE & LEATHER CO., 1208 Majestic Bldg., Chicago, Ill.; 1027 Broadway, Denver, Colo.

Dear Sir:—Please send me at once, without obligating me, sample of Durable Tread leather, booklet, copy of guarantee, price of Durable Treads and special discount offer.

Name..... Street Address.....

City..... State.....

My Tire Sizes are.....

This is what will happen to your tires this winter.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

This Is The Way They Swear by "BRICTSON" Detachable Tire Treads

When you get tired of swearing at Tire Troubles, try "Bricton" Tire Treads. You'll swear by "Bricton Treads" to the end of your motoring days.

3 Years
29,000 Miles
Not Worn Out Yet

Don't You Want That Kind of Tire Service?

The End of Tire Troubles

The End of Excessive Tire Expenses

F. J. Baker
Department Store.
Dings, Jewelry, Hardware, Station Goods and Furniture.
All Kinds of Repairing a Specialty.
Aurora, So. Dak.
July 13th. 1912.

State of South Dakota.,)
County of Brookings.)

I, Fred Baker, a Merchant of Aurora, So. Dak. being duly sworn, do dispose and declare on oath that during the year of 1910 I purchased a complete set of "Bricton" Detachable Treads which I have used continually for 3 years and during that period have travelled more than 29,000 miles. Three of the original rubber casings and inner tubes are still on the car and in good condition, having never been off the car for repairs and from all appearances look good for 10,000 miles more.
I further declare that during this time I did not experience any tire trouble whatsoever except the replacement of one casing which was in poor condition when the tread was applied.

F. J. Baker



Subscribed and sworn to before me this Sixth day of August 1912.

O. O. Trygstad
Notary Public



Send 12 Cents in Stamps for this Picture in Colors.

We Can Prove To You—

That "Bricton" Detachable Tire Treads will save you \$3 out of every \$4 you are now spending for tires.

That "Bricton" Treads are a big success from every standpoint and have been successfully used for several years by thousands of motorists.

That "Bricton" Treads are perfect in service and correct in principle, notwithstanding the "knocks" of tire makers, tire dealers, and others who are envious of our success.

If you want to make a discovery that will show you a great light on the tire question, just sign and send in one of the coupons. No obligation, no expense, but just a little "education" that will save you hundreds of dollars for the balance of your motoring days.

O. A. BRICTSON, Pres.

The Bricton Mfg. Co.
Brookings, S. D., U. S. A.

O. A. Bricton,
Pres.

The Bricton Mfg. Co.
1122 Bricton Bldg., Brookings, S. D.

Without obligation on my part send me your Exclusive Agency Proposition, 1912 Catalogue and Dealer's Folder.

Name

City..... State.....

County.....

O. A. Bricton,
Pres.

The Bricton Mfg. Co.
1122 Bricton Bldg., Brookings, S. D.

I am interested and would like to know more about your booklet "The Enemy of Tire Expense," Proofs from Automobile Owners, Prices, Etc.

Size of Tire.....

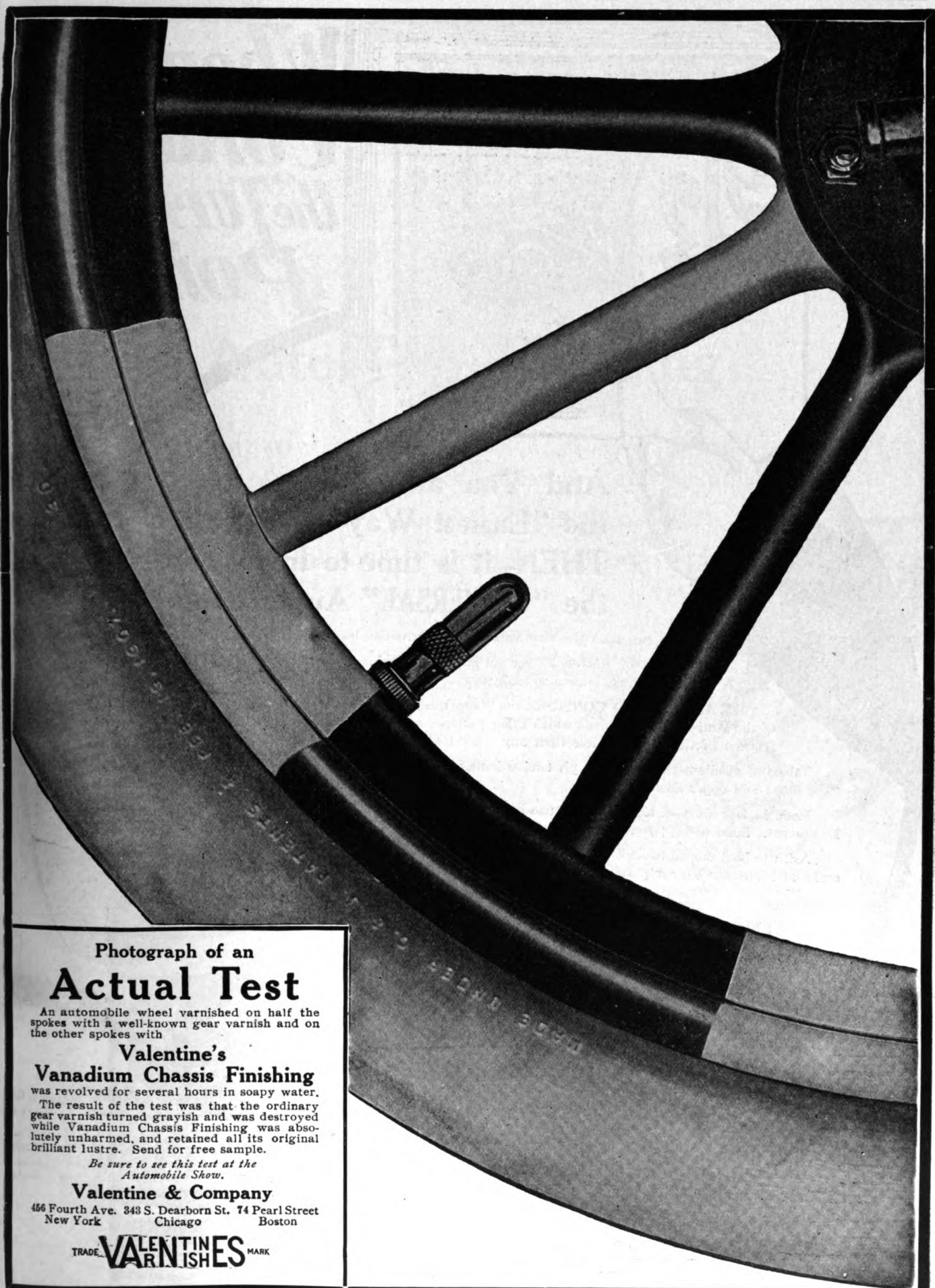
Name

Address

Dealer's Name.....

← TEAR OUT →

Please mention the Automobile Dealer and Repairer when writing to advertisers.



Photograph of an Actual Test

An automobile wheel varnished on half the spokes with a well-known gear varnish and on the other spokes with

Valentine's Vanadium Chassis Finishing

was revolved for several hours in soapy water.

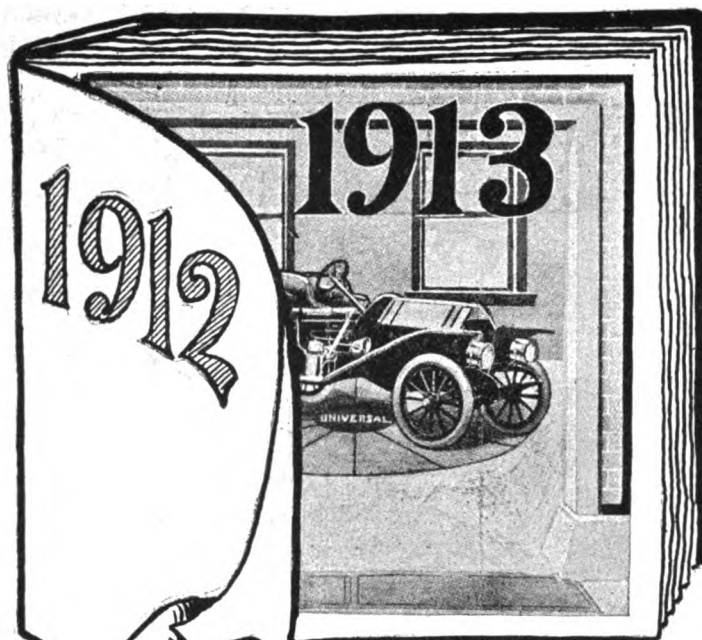
The result of the test was that the ordinary gear varnish turned grayish and was destroyed while Vanadium Chassis Finishing was absolutely unharmed, and retained all its original brilliant lustre. Send for free sample.

*Be sure to see this test at the
Automobile Show.*

Valentine & Company

456 Fourth Ave. 343 S. Dearborn St. 74 Pearl Street
New York Chicago Boston

TRADE **VALENTINE'S** MARK
VARNISHES



*When You
Come To
the "Turning"
Point*

And You are Looking for
the "Easiest Way" to "Turn"
THEN—it is time to Investigate
the "UNIVERSAL" Auto Turntable

You can start the new year with less trouble, less expense, less friction.

With the "Universal" you get greater strength and durability. You can turn the heaviest truck or touring car, and so easily that a 12 year old child can do it.

WE ASK YOU TO CONSIDER the "Serpentine" Ball Bearing Race Course. This is the solution of the Anti-Friction problem, which other patterns have failed to overcome. This construction has reduced friction over 50% less than any other table.

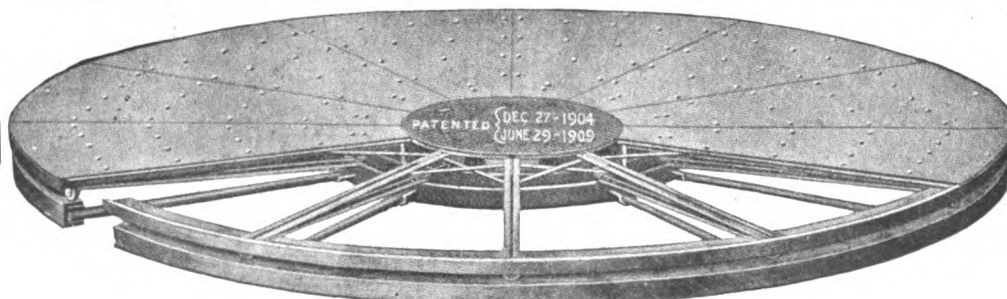
Tables of all diameters require a pit twelve inches in depth to contain each. It is possible to place the "Universal" on upper floors.

Made in four sizes—a size for every use and every car. Get our Catalog "C-10" on "Universal" Garage Equipment. Send to-day; you need it.

Ask us about our Auto-Jack and Emergency Truck, and "The handiest Tool in the shop," Portable floor crane and hoist—two other great garage conveniences.

SEND FOR COMPLETE LITERATURE.

THE CANTON FOUNDRY & MACHINE CO., Canton, Ohio.



TOTAL DEPTH 12-IN.



CONCRETE ANY DEPTH AND GROOVED TO WATER DRAIN

Please mention the Automobile Dealer and Repairer when writing to advertisers.

AUTO-TOPS can be made waterproof and weatherproof, and at the same time renewed in appearance and life, with

“F-S” EVERNEW Auto-Top Dressing

It is positively non-injurious—dries quickly and is easily applied. Very effective for leaky, moisture-holding mohair tops.

Eight standard colors—special shades to order.

Write today for color card and prices, and further information.

“Evernew” Auto-Top Sizing for first coat on mohair, cloth or canvas tops that have never been painted.

“Evernew” Auto-Body Enamel in colors to correspond with our “Evernew” Auto-Top Dressing. Special shades to order.

Felton, Sibley & Co., Inc.

*Manufacturers of Colors,
Paints, Varnishes,*

136-140 N. Fourth St.,
PHILADELPHIA, PA.



Please mention the Automobile Dealer and Repairer when writing to advertisers.

No-Rim-Cut Tires—10% Oversize



*The Odometer—
The Premier Salesman for the Goodyear Tire*

*It is putting these tires, on an average,
on 100,000 wheels monthly*

Let the Figures Tell Which Tire

When men bought tires by guesswork, hardly more than *one per cent* of all tires sold were Goodyears.

One rival sold *30 times as many*. Others 16 and 24 times as many, as shown by royalty figures.

Then came the vogue of odometers. Motor car owners began to measure tire mileage.

Under that custom, No-Rim-Cut tires *jumped to*

the topmost place. They now outsell all others.

In the past three years—with the general use of odometers—No-Rim-Cut sales have doubled six times over—*multiplied twelve times*. And the demand is increasing nowadays faster than we can build factories.

That's the result of actual measured mileage. Men who once bought blindly now make their comparisons. *And the best tire wins.*

What the Odometer Told

For years and years we have used an odometer to guide us in building tires.

We built in our factory a tire-testing machine, fitted with an odometer. On that machine four tires at a time are being worn out here under actual road conditions.

Thus we have compared some 240 formulas and fabrics. We have compared countless materials and methods. And rival tires have been compared with our own.

This odometer told us which methods were best. It told us when our tires outlasted all others. And it told the same story to the armies of motorists, on their metered-mileage cars.

So this patent tire, if built no better than others, means an average saving of 4% per cent. Tens of thousands of men have proved this.

Now 250,000 Users

Now Goodyear tires are used, we figure, on not less than 250,000 cars. During the season of 1912, over 100,000 new cars went from the fac-

ories equipped with them. Our this year's sales will exceed \$25,000,000.

And the demand for these tires is now increasing faster than ever before.

Try them, then watch your odometer. It's an unbiased adviser, and it never lies. For your own good, settle the tire question, as we settle it here, by the figures on the dial.

Told How to Save 48 Per Cent

Odometers showed the savings made by tires that can't be rim-cut.

With old-type tires, statistics show that 23 per cent become rim-cut. With No-Rim-Cut tires, experience proves that rim-cutting never occurs.

And odometers proved that our 10 per cent oversize, under average conditions, adds 25 per cent to the tire mileage.

No-Rim-Cut tires are made, when wanted, with this ideal Non-Skid tread.

It's an extra tread, made of very tough rubber, vulcanized on to the regular. Thus a double-thick tread with wonderful wear-resistance.

The extra tread consists of deep-cut blocks, which present to the road surface countless edges and angles. They grasp with a bulldog grip.

Each block widens out at the base, so the strain is distributed over the fabric the same as with smooth-tread tires. That's immensely

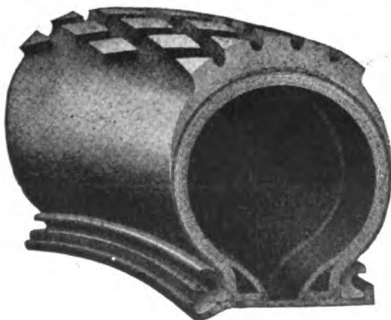
Goodyear Winter Treads

important. It was lack of this feature which made non-skid tires short-lived.

One glance at these treads will show you that our experts have solved the non-skid question as well as they have the rim-cutting.

Safety in winter requires an efficient non-skid—actual, enduring protection. Please judge for yourself if we have it.

The Goodyear Tire Book—based on 12 years of tire making—is filled with facts you should know. Ask us to mail it to you.



GOOD YEAR
AKRON, OHIO.

No-Rim-Cut Tires

With or Without Non-Skid Treads

Our experts worked for three solid years in perfecting this Goodyear Non-Skid. For this tread involves a dozen serious questions.

The tread must be immensely tough and enduring. It must retain its efficiency over thousands of miles.

It must present a broad surface, and yet grasp slippery roads with a relentless grip. It must distribute the strain, else shocks must be borne by only a part of the fabric.

Tens of thousands of tests have proved that this tread meets all these requirements. The demand for this year has become overwhelming.

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO

Branches and Agencies in 103 Principal Cities
More Service Stations Than Any Other Tire

We Make All Kinds of Rubber Tires, Tire Accessories and Repair Outfits
Main Canadian Office, Toronto, Ont.—Canadian Factory, Bowmanville, Ont.

(864)

Please mention the Automobile Dealer and Repairer when writing to advertisers.

IT HAS THE GRIP



MULTIBESTOS BRAKE LINING HOLDS YOUR CAR FAST

Think of the responsibility resting upon the brake lining of your car! It must stop the car slowly, quickly, or instantly. It controls the pleasure of motoring, protects your life and property.

Consider Quality First.

MULTIBESTOS

"The Brake Lining of Quality."

That is why it is used by so many quality car manufacturers, thus increasing the brake efficiency of their product.

That is why so many jobbers and dealers are selling it with profit.

That is why so many car owners insist on its use to their advantage and economy.

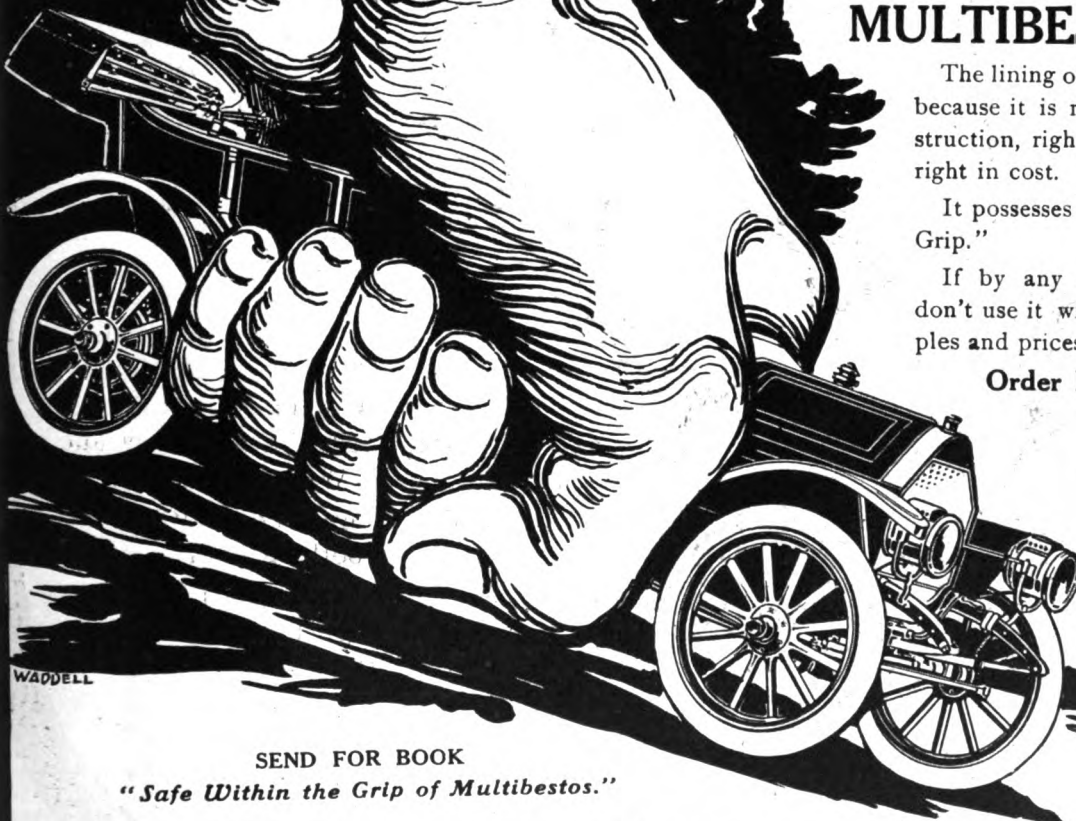
MULTIBESTOS

The lining of YOUR Car because it is right in construction, right in quality, right in cost.

It possesses "The Right Grip."

If by any chance you don't use it write for samples and prices.

Order Now!



SEND FOR BOOK


"Safe Within the Grip of Multibestos."

STANDARD WOVEN FABRIC CO., WORCESTER, MASS.

SELLING AGENCIES { NEW YORK—237 Lafayette St., Flint & Chester. PHILADELPHIA—1427 Vine St., Petry Cassidy, Inc. CHICAGO—1430 Michigan Blvd., F. E. Sparks. DETROIT—1598 Woodward Ave., Fred E. Holmes Co. BOSTON—90 1/2 Boylston St. BUFFALO—720 Main St. TROY, N. Y.—422 River St. ST. LOUIS—Capen Belting & Rubber Co. SAN FRANCISCO—Fred Ward & Son.

SEND US YOUR WORN-OUT ANNULAR BALL BEARINGS



We Will
Regrind and
Make Them
as Good as
New  

We regrind all kinds of Annular Bearings. Also carry a complete stock of S. R. B. Annular and Thrust and New Departure Double Row and Radax Bearings. We have a large stock of reground bearings on hand for immediate exchange, both at Chicago and New York. We can fit you up no matter what your bearing troubles are. All sizes high grade steel balls in stock.

GET OUR PRICES

AHLBERG BEARING CO.

1777 Broadway
NEW YORK

2632 Michigan Ave.
CHICAGO

Here's a Good One!

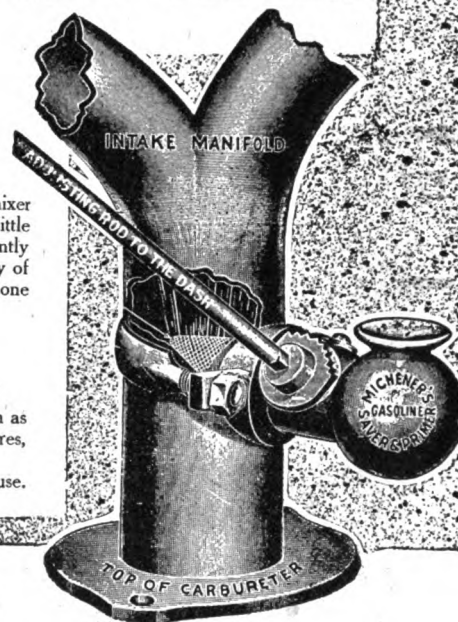
MICHENER'S GASOLINE SAVER AND PRIMER



Since the low test gasoline you now use does not vaporize at low temperatures, and is explosive only when in the form of a vapor, it follows that a cold engine will not start as readily as a warm one.

The Michener Gasoline Saver and Primer remedies this trouble. By filling the mixer bowl with gasoline, opening the valve a little when you crank, the motor will start instantly because the pistons draw a rich vapor spray of gasoline and air through the wire gauze cone directly into the cylinders.

It saves 25% in gasoline.
It increases the speed at least 25%.
It acts as a brake on the hills.
It reduces carbon formation.
It enables you to regulate the carburetion as you drive along for different temperatures, altitudes and speed conditions.
It pays for itself many times in a season's use.



Here's the Evidence From Reliable Men:

(These Letters are on File in my Office)

Maxwell

"On a run of 8 1/2 miles the average was 16 1/4 miles to the gallon. Previous to this the very best we could do without your Gasoline Saver was 9 miles to the gallon."
F. KAHLER, JR.,
New Albany, Ind.

Sec'y The Kahler Co., Mfg. of Auto Bodies.

Moon

"On a fixed throttle of 7 miles per hour we can show 18 miles, an increase of 11 miles, by merely admitting the air through your device."
H. H. SMITH & BRO.,
Willow Grove, Del.

Gas Engine Dealers.

Hudson

"I am sure it saves at least 20% gasoline. It's fine these cold mornings for starting my motor."
DR. F. E. ANDERSON, Sioux Rapids, Ia.

Buick

"It gives perfect carburetion under all conditions. I now obtain about 20 miles to the gallon gasoline. Heretofore about 12 miles."
D. B. HAWLEY, M. D.,
Bridgeport, Conn.

Marion

"Have driven automobile since 1902, but never have I seen a device so simple in construction work such phenomenal results."
CLARENCE L. WEIMER,
Lebanon, Pa.

Sec'y Weimer Machine Works Co.

Ford T

"It gives more speed on the same or less gas and is fine for priming my Ford T."
A. C. SHANNON, Washington, D. C.
Mgr. Loose-Wiles Biscuit Co.

Stevens-Duryea

"The results obtained from your device are remarkable."
ELMER A. SHERMAN, Belfast, Me.
Mfg. of Leather Board.

Cole

"I have increased the mileage from 10 miles per gallon gasoline to 13 miles by the installation of your device."
S. PIEK, Buffalo, N. Y.
Niagara, Lockport & Ontario Power Co.

American

"When running my car throttled at 15 miles an hour by use of your device it shows an increase of 20% in speed."
ALAN LEAMY, Columbus, Ohio.
Mgr. Weisbach Co.

Rambler

"It is just what is needed to get the adjustment while running on the road. It increases the speed and saves gasoline."
L. G. MARTIN, Pittsburgh, Pa.
Rambler Dealer.

6-60 Motor

"Your device is a great help in starting my 6-60 motor."
H. M. FRY, M. D., Riverside, Wash.

Mitchell

"I made 92 miles on five gallons of gasoline with your device on my Mitchell. Previous mileage was 9 to 11 miles per gallon."
GEO. H. LEE,
Bridgeport, Conn.

Cadillac

"With your device I can start my Cadillac every time with a spin of the crank, with water frozen solid in the pan under the car."
E. J. KODERICK,
Rumford, Me.

General Merchandise.

National

"Would not be without your Gasoline Saver and Primer. It is handy to prime the motor and saves gasoline."
J. E. ROPKE,
Bernamwood, Wis.

E. M. F.

"Am now able to get 18 and 19 miles to the gallon by the use of your device. Heretofore only 13 miles."
H. R. WILLIS,
Everett, Wash.

Loans, Insurance and Real Estate.

Chalmers

"It gives absolute control of the carburetion and in this altitude is a marvelous addition to any car."
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Pres. Globe Cement and Construction Co.

PRICE \$5.00, Dash Control; \$6.00 Steering Post Control. Express Prepaid.

Either Nickel or Brass Connections.

Note: When ordering, state side of motor carburetor and steering post is on. This device is made both right and left.

Guarantee: The Michener Gasoline Saver and Primer is guaranteed to save gasoline, increase the speed on same amount of gasoline and to be an infallible Primer. If after 30 days' trial the purchaser is not absolutely satisfied he can return it and the money will be immediately refunded.

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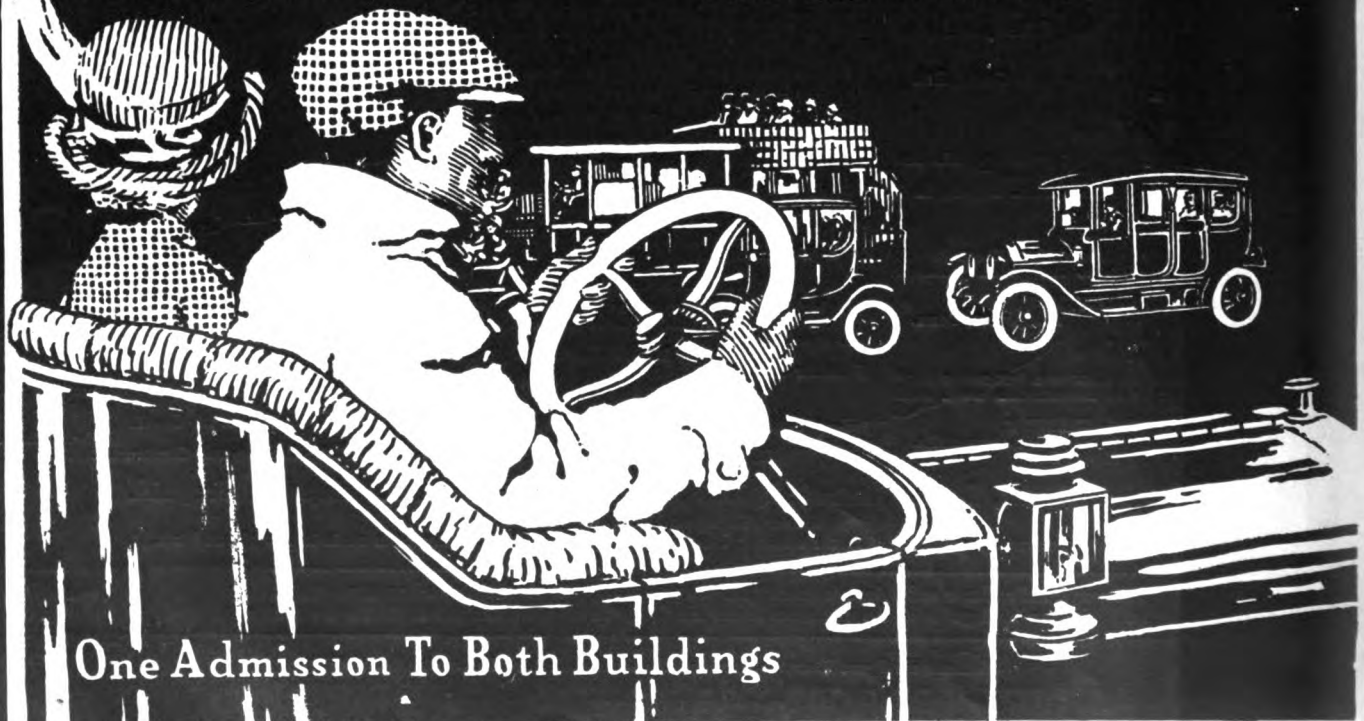
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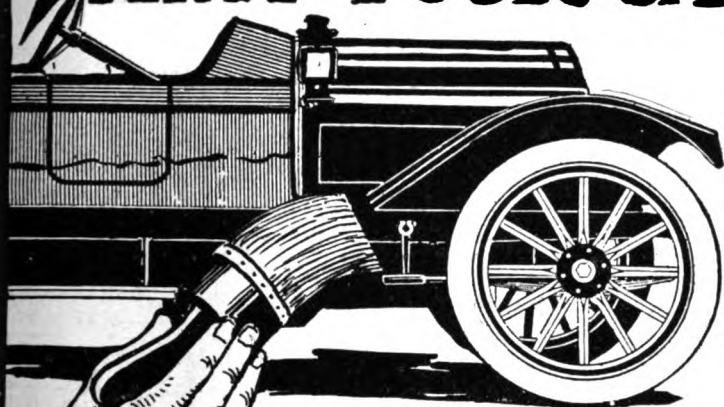
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WORKS PERFECTLY IN COLD WEATHER

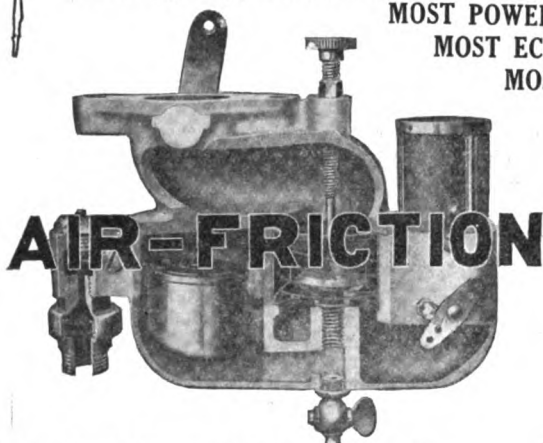
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*Starts Easily on the Coldest Mornings
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They make a Gas, not a Spray.
Less gasoline per mile.
A hill climber and a money saver.
Adds power to the motor.
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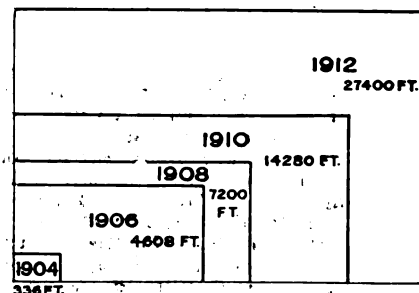
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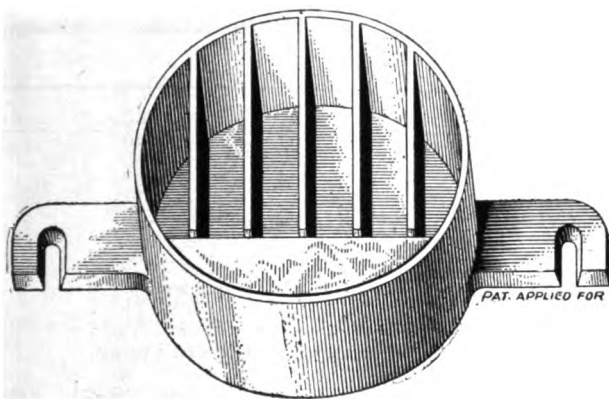
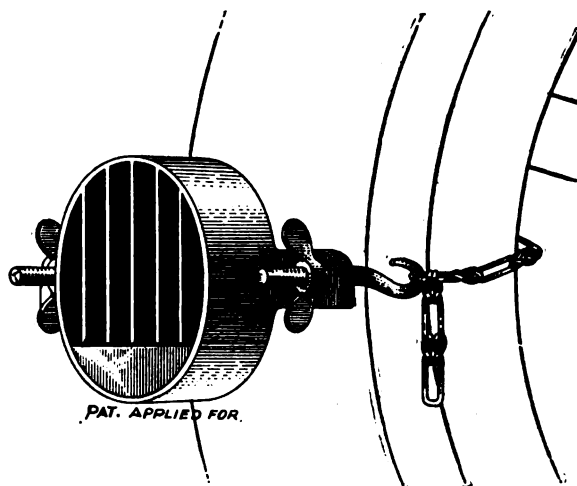
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It will do anything that any ordinary Vulcanizer will do.

Perfectly reliable, cannot burn, scorch or over-cure your tire.

We send these vulcanizers to you with a guarantee so broad that competitors cannot possibly meet the requirements—

Your money back if it does not make good in every particular.



Don't neglect your tires. Those little, insignificant cuts admit the sand and water. With every revolution of the wheel the sand works in farther and farther until it reaches the fabric; loosens the rubber from the fabric in all directions. The water rots that fabric and weakens it until it cannot longer support the inner tube. Then "BANG" and you have a blowout.

Such a mishap could never occur if you had a "PEERLESS" Automatic Vulcanizer and used it before the cut or crack got to the "Danger Point." It is the best Automatic Vulcanizer in the world. Covers a space four inches in diameter and does its work absolutely perfect.

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EVERY MOTORIST KNOWS

that tires grow weaker with each day's use and age till they finally blow out at the weakest place.

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By reinforcing the fabric with K & W RELINERS you get many additional miles of service, besides making punctures and blow-outs impossible. K & W Reliners will easily reduce your tire expense 50 per cent.

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The exclusive features found in K & W Reliners are fully covered by patents and **cannot be found in any other reliner made.** Every K & W Patented Reliner is backed by our positive guarantee of service and satisfaction.

Write for our K & W Tire Accessory Catalog, containing prices of our "Patent" Reliners.

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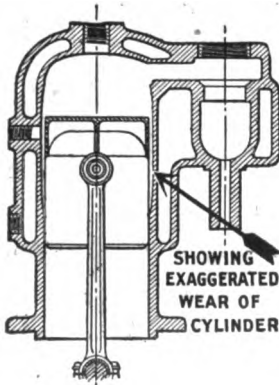
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The cylinders must have a true bore and well-fitting pistons and rings. Other parts of your automobile may be in the finest possible condition, but if the cylinders have worn larger in diameter or have been scored your motor cannot develop full power.

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It's like having a new machine.

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What is the cost of reboring.....cylinders.....
inches diameter, furnishing and fitting new pistons and rings? The
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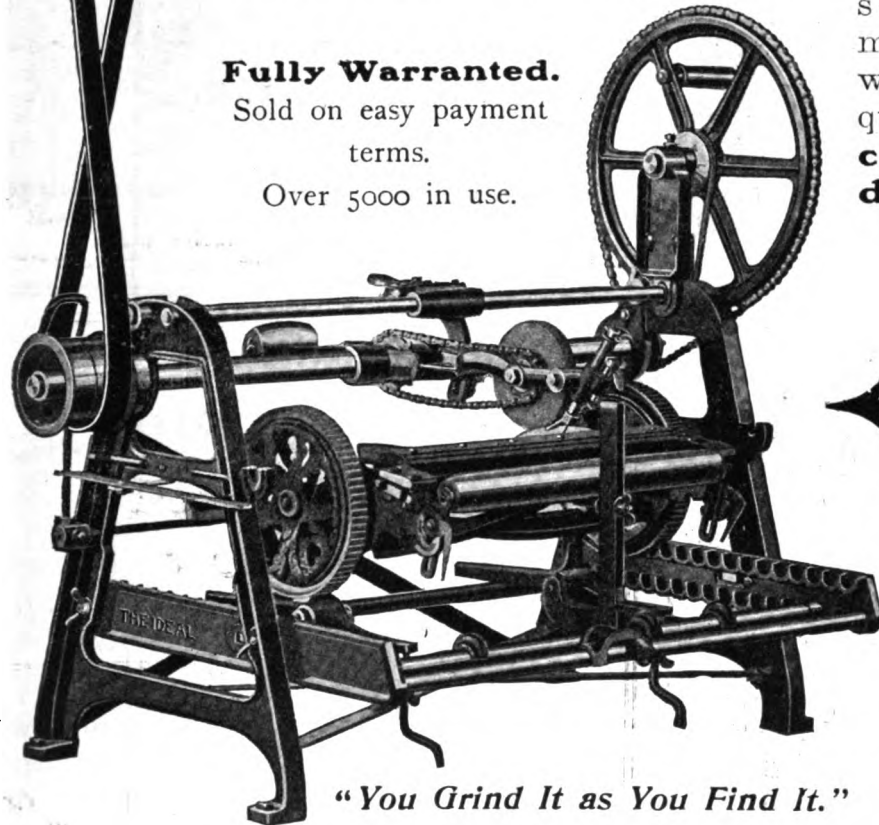
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DEALERS—GET OUR SPECIAL OFFER
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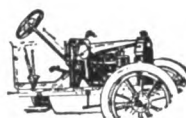
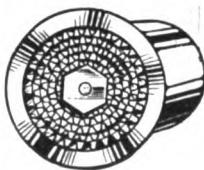


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6/10 ampere at
6 volts.

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Saves from 50 to 75% on oil and gasoline. Gives more power to the car. Stops back-firing and makes the car run smoother.

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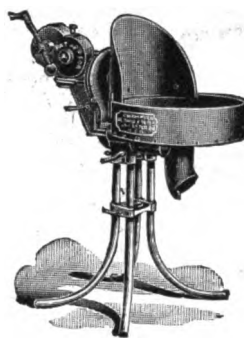


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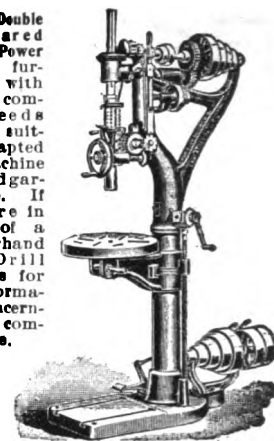


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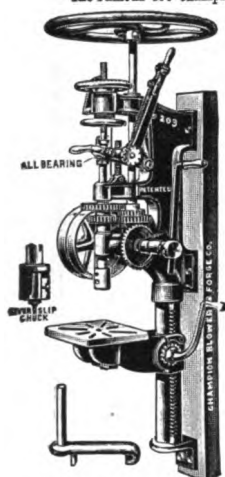


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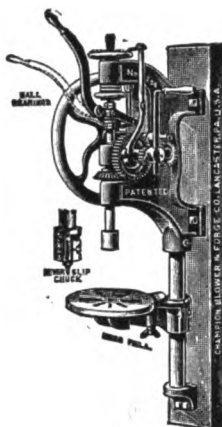


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Made with Ball Bearings only. With the Lever or Automatic Self-Feed 95 per cent in Time and Labor is Saved by the instantaneous Raising of the Drill Bit out of the hole just bored and again replacing the drill bit back on the material ready to bore the next hole. Remember—There is NO TURNING BACK of the Screw NUT with EITHER FEED.

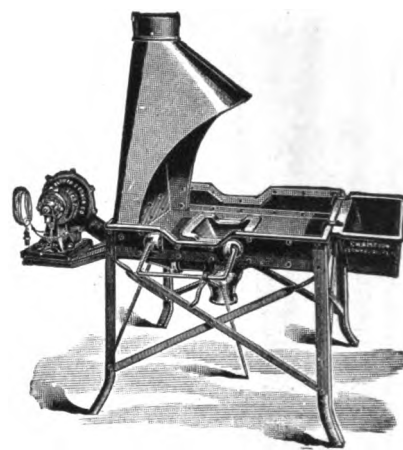
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TIRES

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22 38	32 x 4	4 21
23 95	34 x 4	4 44
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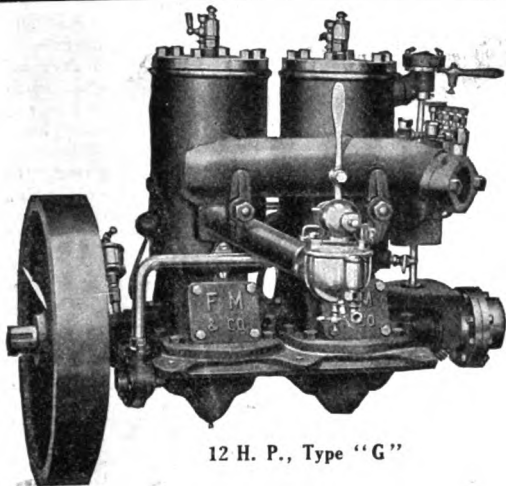
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Furthermore, the center electrode is scientifically tempered to withstand the highest temperature of the engine, and after being assembled, all parts are subjected to heat and thoroughly baked to prevent undue expansion in service.

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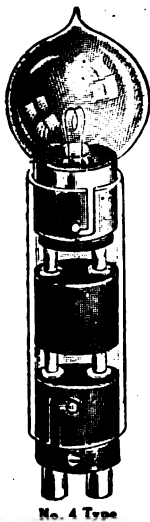
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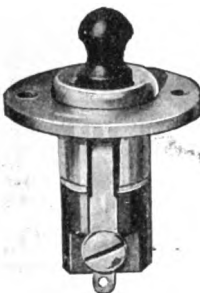
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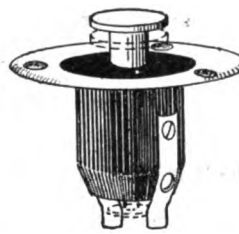
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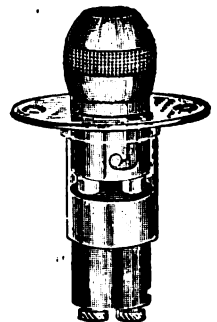
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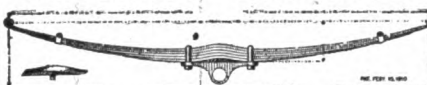


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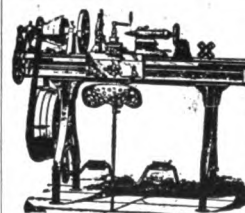
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9' swing
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OUTFITS**
LEAST WEAR AND CARE
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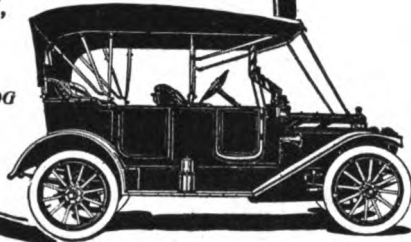
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You'll want to keep it once you've studied
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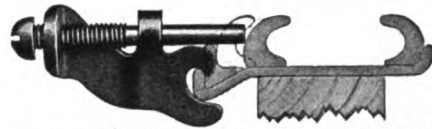
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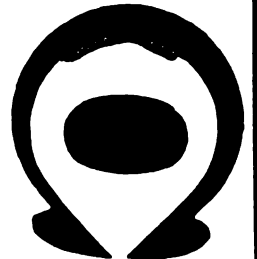
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Size	Casing	Tube	Size	Casing	Tube
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30x3	10.75	2.75	36x4	19.50	5.40
32x3	10.50	3.00	37x4	22.50	5.75
28x3½	12.00	3.00	32x4½	20.00	5.50
29x3½	14.50	3.15	33x4½	23.00	5.60
30x3½	14.50	3.75	34x4½	23.50	5.75
31x3½	15.00	3.75	35x4½	24.50	6.00
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30x3½	5.25	3.35	34x4½	7.50	5.10
32x3½	5.50	3.55	35x4½	7.60	5.25
34x3½	5.75	3.95	36x4½	8.00	5.50
30x4	6.20	3.75	34x5	8.10	5.60
31x4	6.25	4.80	35x5	8.25	5.75
32x4	6.40	4.90	36x5	8.50	6.00
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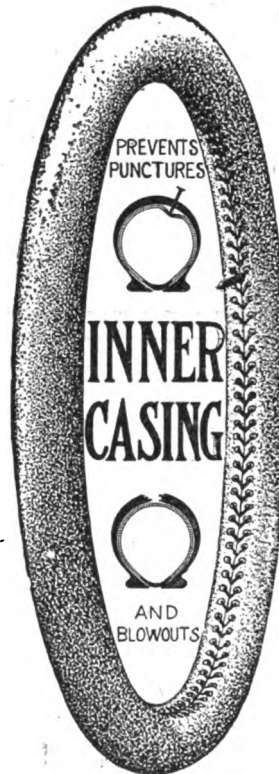
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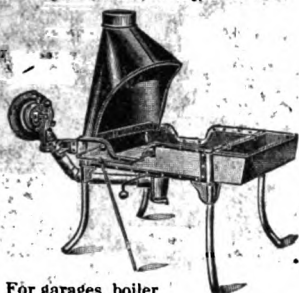
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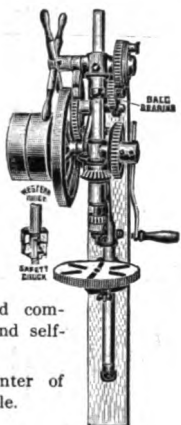
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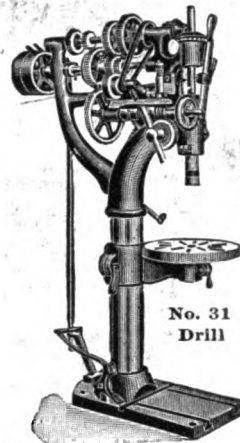
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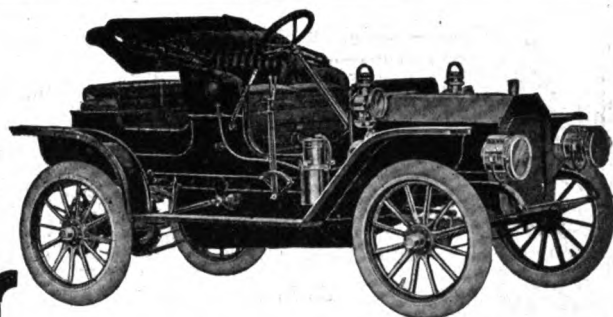
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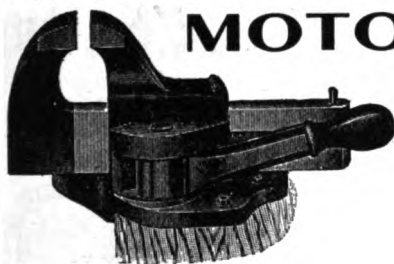
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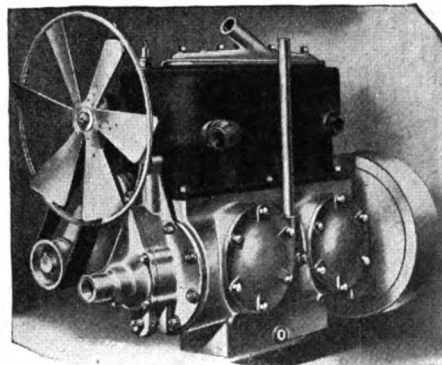
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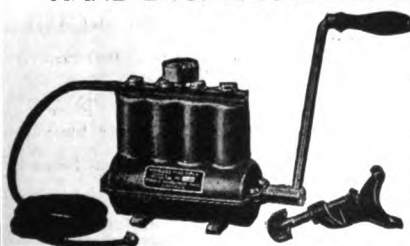


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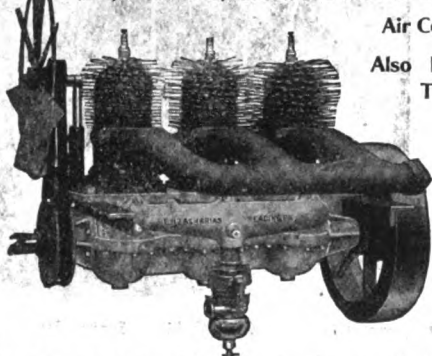
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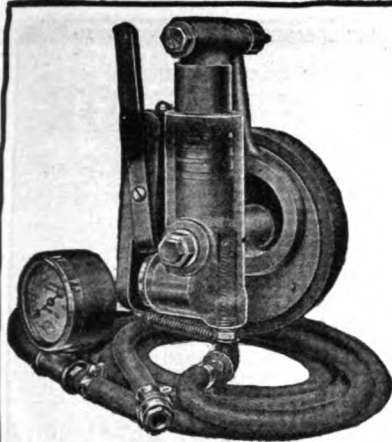
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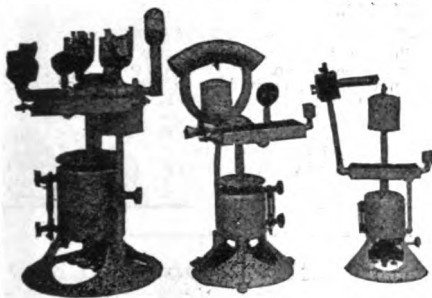
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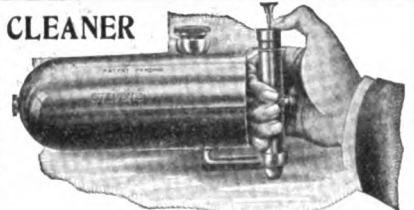
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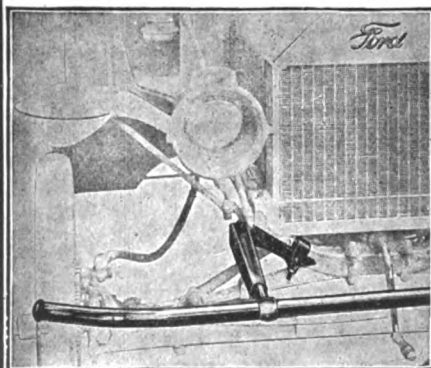
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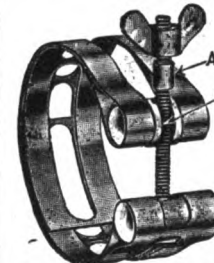
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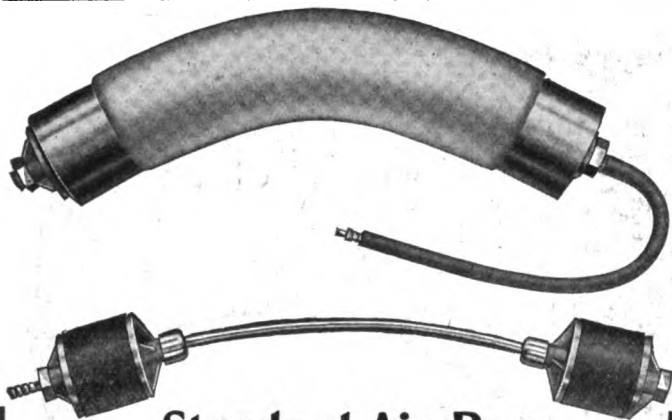
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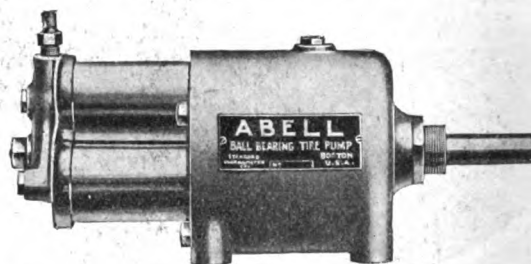
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A JOURNAL OF PRACTICAL MOTORING.

VOL. XIV, No. 4.

NEW YORK, DECEMBER, 1912.

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ELECTRICAL VEHICLES CONTINUED.

The Controller, the Spark and Circuit Breaking Troubles and How to Find Them.

No. 5.

BY SYDNEY F. WALKER.

One great beauty again of the electrically driven vehicle is the whole of the above arrangements, causing starting from rest, the acceleration after starting, the variation of speed when required, and the reversal, are carried out by the controller. Views of a typical controller are shown in Fig. 11.

Readers will be familiar with the street car controller, so far as its outside appearance goes, and its manipulation by the street car driver. It will be remembered that the driver has a handle which moves over a numbered plate, a finger following the handle, and pointing to the different numbers. The handle is attached to a drum as shown in Fig. 11, the drum being made of insulating material, and carrying upon its surface, segments of brass or copper. The drum revolves through a certain portion of a circle, as the handle is moved, inside a containing case; and on the inner side of the containing case are fixed fingers, as shown, insulated from the case and insulated from each other, which bear upon the segments carried by the drum. The segments on the drum are of different angular length; that is to say, they form different arcs of a circle; and are fixed at different portions of the surface of the drum. The metal segments carried by the drum are connected to insulated conductors passing up inside of the drum, and the fingers fixed to the outer containing case are also connected to insulated conductors. Between the segments carried by the drum, and the fingers which bear upon them, the different connections necessary to carry out the arrangements for varying the speed, for starting, for accelerating, and for reversing, detailed above, are made. Thus, when the handle moves to the first stop, as it would be in the case of the starting resistance of a stationary motor, when the finger of the street car motor moves to the first number, the first set of connections are made, inserting the resistance in the circuit between the accumulators and the motor, and connecting either the accumulators in parallel, or the field magnets of the motor in series. When the drum is moved round a little further, the next set of connections are made, say cutting out the resistance from the paralleled accumulators, or the series connected field magnets. When the handle is moved round still farther, the next step of connections are made, and so on.

As explained above, reversal may be arranged for in two ways. The revolution of the drum in the opposite direction may be made to perform the work of making the reverse connections; or a separate switch may be provided for reversing the connections, and then the controller handle is moved forward in the same manner as for forward speed. In either case it is of absolute importance that the current shall be cut

off completely from the motor, before the connections are reversed, and the current is sent into the motor coils in the reversing direction. With both arrangements, this is automatically carried out. With the reversing switch, it is impossible for the driver to turn the current in the reverse direction until he has first turned the handle, and with it the drum, back to the position when no current is passing into the motor

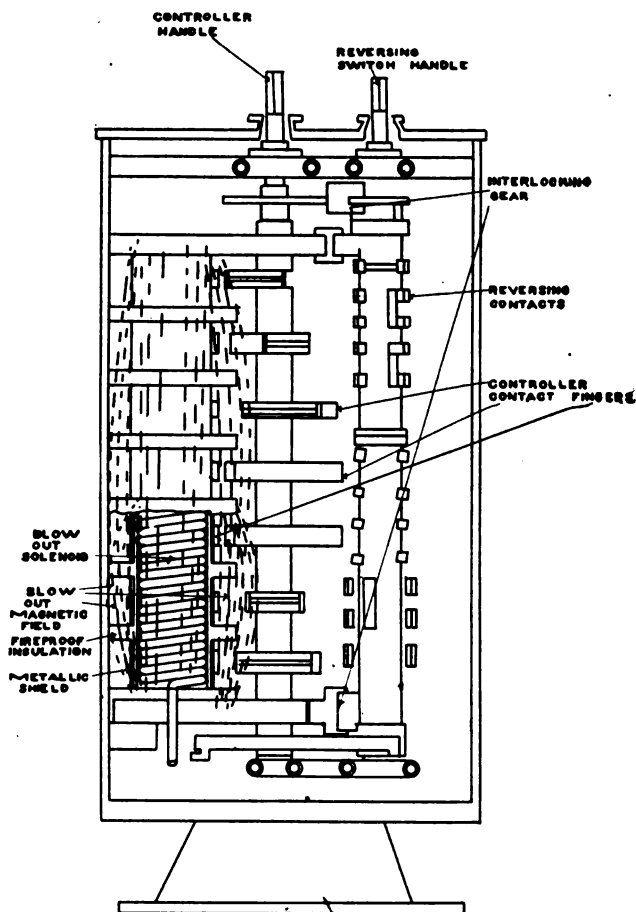


Fig. 11. Diagram of Controller, Showing Insulated Drum Reversing Handle, Blowout Magnet, Etc.

coils. He cannot move the reversing switch from the position in which it is locked until he has done that. And when the car is moving backwards, when the motor is moving in the reverse direction, the driver cannot turn the current in the motor in the forward direction, until he has first brought the handle right back, so as to cut off the current completely from the motor, and then he reverses the switch.

Similarly, where the controller is made to do the whole work, reversal can only be accomplished by first bringing the handle back to the point of rest, where no current is passing through the motor coils, and then moving it on in the reverse direction. It is

somewhat similar to the arrangement for the driving of locomotives and winding engines.

Another point that should be mentioned here is, the matter of the sparking between the segments upon the drum, and the fingers which bear upon it. It will be understood that the segments on the drum are of just such a length, or of such a number of degrees of arc, that they engage with the particular fingers, exactly at the right moment, when a particular series of connections is to be made. It follows also that when the particular set of connections formed by one or more segments, and one or more fingers is no longer necessary, and when another set of connections has to be formed, the first set of connections has to be broken, and the fingers are disengaged from the segments against which they bore, by the revolution of the drum. When the fingers leave the segments, a spark passes; and this has to be provided for in some way. Usually what is called a magnetic blow out is employed to extinguish the spark.

The Spark on Breaking Circuit.

The spark which always passes whenever an electric circuit is broken—between the severed ends of the circuit—between the portions of the circuit on each side of the break, is one of the most important phenomena in connection with the working of electrical power services, particularly motor car and street car services. The spark which passes is due to the inertia of the circuit. It represents the persistence of the electrical pressure which has been causing the current to flow through the circuit, after the circuit is ruptured. Further, in nearly all circuits in all in which electro magnets are engaged, as in all motor circuits, what is called self-induction adds to the strength of the spark which passes. When a current passes through any electrical conductor, it creates a magnetic field around it, and the continued passage of the current causes the continued presence of the field. When the current ceases, the energy absorbed by the creation of the magnetic field around the conductor, returns to the conductor, and gives rise to a temporary increased pressure, which is manifested in the form of the spark mentioned above. Where the conductor is coiled on itself a number of times, as in the case of all electro magnets, the effect is very much multiplied, as each portion, and there may be a very large number of them, adds to the effect of all the others. The result is that the spark at opening circuit may be very powerful under certain conditions; notably under such conditions as are present in the case of an electrically driven vehicle. In ordinary town electric light services, a spark passes every time an ordinary lighting switch is opened; and it will be noticed that very careful precautions are taken that the spark shall not develop into an arc. In the usual method with switches for controlling the current for lighting and stationary power services the moving part of the switch springs very quickly back from the stationary part, the distance to which it is carried being too great for an arc to form, and the time occupied in springing back being also such that the arc is quenched. When the pressure is comparatively high, or if it is not possible to make arrangements of the kind described for stationary switches, to ensure that the distance between the moving part and the stationary parts of the switch very quickly rises beyond that at which an arc can form; other methods have to be employed. One of these methods is what is called the magnetic blow out; and another method is the air

blow out. In the ordinary street car controller, and in controllers employed for almost every kind of service, it is not usually possible to arrange a quick long break between the finger and the segments upon the drum that it is leaving; and hence unless something is done to prevent it, an arc will be set up between the two metals, which will probably fuse both of them.

The arc that is formed is practically the same as that which is employed in arc lamps that are used for illuminating streets, etc., and it is formed between the ends of two carbons. In arc lamps, the distance between the carbons is sometimes only 3-32 inch, and never much above $\frac{1}{2}$ inch. The temperature of the arc or bridge of flame passing between the carbon points is very high, somewhere in the neighborhood of 5,000 degrees Centigrade; and it will fuse any metal that is introduced into it. The same kind of arc, if allowed to do so, will form between the moving part of a switch and the stationary part, and the enormous temperature will burn up both metals in the course of a few seconds. It will be seen, therefore, how very important it is to prevent the arc forming. It may be prevented either by the action of an electro magnet, forcing it outwards away from the points between which it is formed, and actually breaking it; or by blowing it in somewhat the same manner by the aid of a cold air blast. The electric, or voltaic arc as it was called in the early days, however it may be formed, obeys the laws of electro magnetism; and in particular it can be forced out of its proper line between the two carbons, if a magnetic field is created, in a certain direction across the arc. If the magnetic field is sufficiently strong, the arc is forced outwards, until the pressure creating it is no longer able to maintain it. With every arc, no matter how it is formed, a certain pressure is required to keep it in existence. This is one of the troubles in the working of arc lamps; the mechanism of the lamp has to compensate for changes of pressure between the ends of the carbons. In the case of a switch, or a moving mechanism for breaking connections, as in the controller, the distance between the fixed finger and the moving segment, when the latter has reached its next position, by the movement of the drum, is fixed; and the pressure creating the arc is lessening from the moment when the arc was created. Hence, if a powerful electro magnet is placed in such a position, that the arc formed between the moving segment and the fixed finger, is forced outwards, away from both the segment and the finger, the arc will be broken down or blown out; and this is the method employed in many forms of controller.

An electro magnet is fixed inside of the controller case, in such a manner that the magnetic field created between its poles, acts upon the spark passing between all the segments and contact fingers, so as to break down the arc that is formed, or to blow it out as it is usually expressed, in the manner described. The arrangement of the magnetic blowout is shown in Fig. 11. The method of blowing out by the arc by an air blast is very similar. There is either a fan, or some other means of producing an air pressure, the air being discharged between the moving and stationary contacts, in such a manner as to at the same time cool the arc, to cool the contacts, and to push the arc outwards in the same manner as is done by the magnetic field.

The writer understands that with the low pressures employed in Edison vehicles, no trouble has been experienced with the spark. The ability to spark and

give trouble increases with the pressure. For electrically driven vehicles, the controller is preferably arranged with its drum lying horizontally in front of the driver, the lever which moves the drum to and fro extending upwards conveniently to his hand, or as is preferred in some cases, assembled round the steering pillar. The controller may, of course, be arranged in a vertical position, with the handle on the top, as in the case of tram cars; but the horizontal position is much more convenient for accumulator driven vehicles.

Troubles, and How to Find Them.

In the United Kingdom, all causes of failure are called "faults"; but in the writer's opinion, the American term "troubles," is very much more appropriate, and as with so many other American terms, very much more descriptive. Troubles may arise in the accumulator, in the motor, in the controller, or in the wires

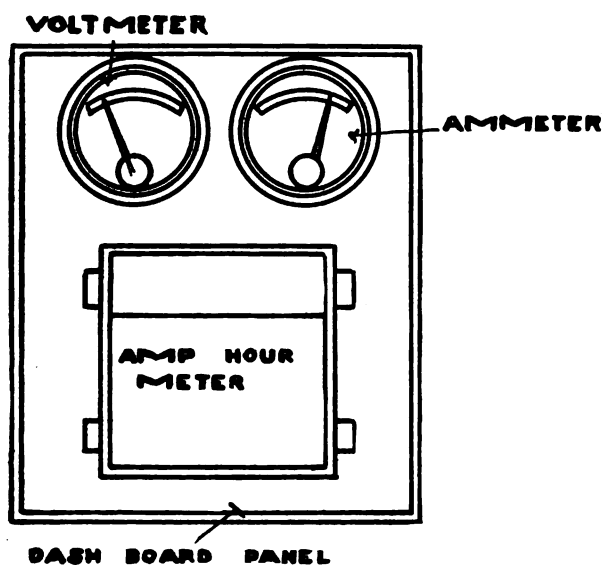


Fig. 12. Diagram Showing Panel for Fixing on Dashboard, with Measuring Instruments as described in the text.

connecting the accumulator with the controller and the motor.

As explained in a previous article, and intimated in the earlier portion of this article, with lead accumulators at any rate, troubles are somewhat frequent in the battery itself. The causes have been carefully outlined in the previous article mentioned; and it will, therefore, be sufficient if the writer indicates how they may be discovered. In the first place, careful watching of the instruments which should be attached to the apparatus, and should find a place on the dashboard of the vehicle, will nearly always give warning of impending trouble. Fig. 12 shows the arrangement of instruments which should rule. One is the volt meter, which shows the pressure at the terminals of the battery at any instant; another is the ampere meter, which shows the current that is passing out from the accumulator, and a third is the ampere hour meter, which shows how much of the capacity of the battery has been taken out. If the driver watches the volt meter carefully, journey after journey, he will soon get to know the usual run of things, how the pressure delivered by the battery falls, as his journey proceeds. He will note, too, that when going up hill, the pressure is temporarily lowered, and again is lowered to a greater extent permanently, after the hill is passed, than after a similar run on level ground.

If any sudden fall of pressure is shown on the volt meter, not due to heavy work, heavy ground, or up hill work, the driver, or whoever looks after the accumulator, will be wise to test it, cell by cell, on the first opportunity. In the most modern electrically driven vehicle, the accumulator is placed in such a position that it can be easily examined. One position is that occupied by the engine of a gasoline automobile, under a bonnet or some similar cover, so arranged that the accumulator can be inspected and tested by throwing the cover back. It would also be wise to note any increase of current passing out from the accumulator, not apparently due to the working conditions. Thus, if when running on a good level road, the current taken suddenly increases, or even if it increases gradually, without any apparent reason, it means that something is wrong between the accumulator and the motor; current is going out from the accumulator that is not doing useful work; and careful tests should be made right through the apparatus, on the first opportunity. The two principal causes of failure, right through the apparatus, are those mentioned as due to the battery; and a breakdown of the insulation. The sudden increase of current mentioned above, is nearly always a sure sign that the insulation of some part of the apparatus is breaking down, or has partially broken down. If it is not made good, stoppage will probably occur, and it generally takes place at some awkward spot where assistance is difficult to obtain. The ampere meter will show also how much charge is left in the battery at any moment. On the other hand, the driver may observe that the current passing out from the accumulator, under certain conditions, is less than it usually is; and he may find that he has to place the controller handle at a point where a higher pressure is being delivered to the motor terminals than should be necessary in order to keep the working current up to the proper figure and the speed at the normal. This will be due to the interposition of an artificial resistance in the circuit, built up by something which is taking place in the working of the apparatus. The most likely point for this to take place is in the controller. The spark that was mentioned above, as passing between the controller fingers and the segments on the drum, no matter how carefully it is blown out, in time dirties the contacts; and dirt always offers a resistance to the passage of the current. Further, the contact between the finger and the segment, tends to become rough with continued work; and the surfaces that should be making contact, tend to become smaller. If any switch, for any purpose, be examined, it will nearly always be found that the actual area of the surfaces in contact, when the switch is closed, is only a portion of the nominal surfaces. For instance, the stationary contacts of a switch may expose say 1 square inch on each side, against which the surfaces of the moving contact piece are to rub. Careful examination will show however, that only half, and sometimes considerably less, of the 1 inch of the moving contact is actually bearing upon the fixed contact. The careful fitting of modern switches has reduced the evil to a considerable extent, but it still exists; and it will easily be understood that no matter how carefully the switch contacts may be fitted in the works, all sorts of little things which come against them tend to lessen the area of the surfaces which bed upon each other. The pivots upon which the moving surfaces work, get slightly worn, and a very slight wear reduces the actual switch surfaces in contact. All this

rules with the contact between the fingers and the segments upon the moving drum of the controller. Necessarily there must be a certain amount of wear between the two, as the one moves over the other. The wear is increased by the heat which is unavoidably liberated at the surface contacts; it is still more increased by the spark which passes; and the matter goes on in a compound ratio, after the trouble has once commenced. A little less perfect bedding means a little more heat, a little more tendency to sparking, and a considerable increase in the imperfect bedding, and so on.

It goes without saying that the lesson which the present writer has endeavored to enforce in all the articles which he has written for this journal, is especially important here. Cheap electrical apparatus is always very dear, because it always requires such a lot of repairs, and is always so liable to break down. It is quite easy to design a cheap controller, with a small drum, small segments, small fingers, and small everything; whose useful life also will be small. Almost from the moment of service, trouble will commence with the contacts. It may be taken as an axiom, that the stronger and larger the controller is made, and the stronger and larger all parts are made, providing that the fitting is good, the better will be the work done by the fingers, other things being the same; and the less trouble, and the less repairs bill will be required by the controller. In particular, the larger the surfaces that bed upon each other, and the more quickly each finger leaves the segment, when contact is to be broken, the better will the control work.

As in so many other cases, space is limited, and therefore the controller that the writer would like to see employed for electrical vehicles, cannot usually be arranged. Makers cannot err in having the controller as large as other conditions will allow; and buyers cannot err in looking out for a large strong controller, providing that the other parts of the apparatus are equally good.

The remedy for the controller faults is frequent examination. Again, it should be taken as an axiom, that every time the vehicle comes into the garage, the controller should be opened, carefully overhauled, contacts carefully cleaned, and the bedding of the fingers upon the segments carefully seen to. A small amount of wear is easily put right; where if it is allowed to increase, it is by no means an easy matter to do so. It is the old tale of the stitch in time.

His Idea of a Car.

"What would you demand in a motor-car if you were to have one built to satisfy your ideal?" asked Charles Chalmers, in a recent talk on 1913 cars. "Let me outline what a purchaser has a right to ask and what nearly every one wants. We'll take, for instance, a car selling at approximately \$2,000.

"It should have a simple, reliable self-starter, preferably of the air-pressure type. It should be electrically lighted by a standard system. It should have large wheels and tires, which make roads level and obviate the possibility of tire trouble.

"Convenience of operation we all want. This is best secured by placing all controls and indicators—such as ignition switch, speedometer, carburetor, adjustment, oil sight feed, horn bulb, self-starter button, air-pressure gauge, ammeter, electric light switch and gasoline pressure pumps—on the dash. The control levers should be easy to reach and the clutch and

brake pedals and accelerator so located that they are easily operated and do not tire the feet.

"Beauty and comfort add not only to the pleasures of motoring, but give longer life to a car. For beautiful and comfortable cars are symmetrical, they are units—not a conglomeration of parts.

"The purchaser of a 1913 model should get an all-metal body with dash built in one piece with the body. The tonneau should have the graceful bell back, doors should be wide and easy to open and close, dash should rise gracefully from the bonnet, lines should be straight, running boards free of incumbrances."

OXY-ACETYLENE WELDING.

Something About the Practice and How to Make a Cheap Plant.

From J. N. Bagley, Nebraska.—For the automobile repair man a good welding plant is not only useful but profitable. The cost of these outfits is heavy, however, ranging from \$300 for the cheapest to \$1,000, depending, of course, on the capacity of the outfit. The machine I will describe here can be built for considerable less than one hundred dollars and has a welding capacity of from one-half to three-quarters of an inch, depending somewhat on conditions.

I, like many others, have wanted one of the welding machines for some time, and have spent a great deal of my valuable time answering advertisements, in the hope that I would, after a while, find something suitable that I could afford to buy. As time passed on I gave up all hopes and set about to manufacture one of my own. Knowing nothing of the process it went slow and cost me quite a little money in experiments that others need not do.

The combining of the oxygen and acetylene gas in correct proportion gives off a heat of six to seven thousand degrees. With this heat it is possible to melt any metal that the repair man has to deal with. Of course, the size of casting welded will depend on the capacity of the machine, as well as the tip used on the welding torch.

Oxygen is a colorless, odorless, tasteless gas that can be produced in numerous different ways. But for the welding machine, especially on a small scale, it will be well to consider the use of potassium chlorate and manganese dioxide as this can be purchased from the drug houses, or it can be bought quite reasonable from a welding supply house with the rods and fluxes, as we will take up later. These chemicals are heated, thus giving off oxygen in an impure state, and by passing the gas through water containing caustic soda purifies it and leaves it in a condition to be used in the welding torch.

Referring to Fig. 1, G, we have the oxygen generator, which consists of a piece of six-inch pipe capped on each end. This can be purchased from a plumbing supply house at a cost of about \$3. Into one of the ends should be cut a hole in one of the caps about three inches in diameter to allow of the chemicals to be put into the generator, and this plate should be bolted onto the cap with stud bolts D, so that it can be removed easily. This generator should be set upon legs about one foot from the platform, or floor if it is a stationary affair. Over the top of this generator should be a cover of sheet iron with an asbestos lining to hold the heat to the generator. Out of the extreme top of the generator should come a one-half inch pipe with a check valve

on top as shown at A, a short nipple and a globe needle valve C, and from there suitable piping to lead to the filter tank containing the caustic and water F.

Before leaving the oxygen generator we will take up the heating which we will do with two blow-torch burners and a compression tank as shown at B and H. This little tank can be put where most convenient, but should be as compact as possible if the outfit is to be portable. The filler plug in the gas tank H, should be air tight, and into the top of the tank should be screwed a bicycle valve to allow pressure to be put onto the tank. This tank, H, should hold with safety about fifty pounds pressure. Of course,

can be figured to an extent the cost of the job. Into the second opening at the top of the tank should be placed a needle valve to allow the control of the flow of oxygen to the torch, to which is connected the hose L. The hose I use is what is called "beer hose" and costs about 5 cents per foot. The hose should be about eight feet long to allow of moving about the work while using the torch. The acetylene tank, M, I purchased from the Carbolight Company of Anderson, Ind. In shape and size it much resembles the Presto tank, but it can be charged in a few minutes with carbide and water. This tank I have used for some time and it works to perfection on the welder.

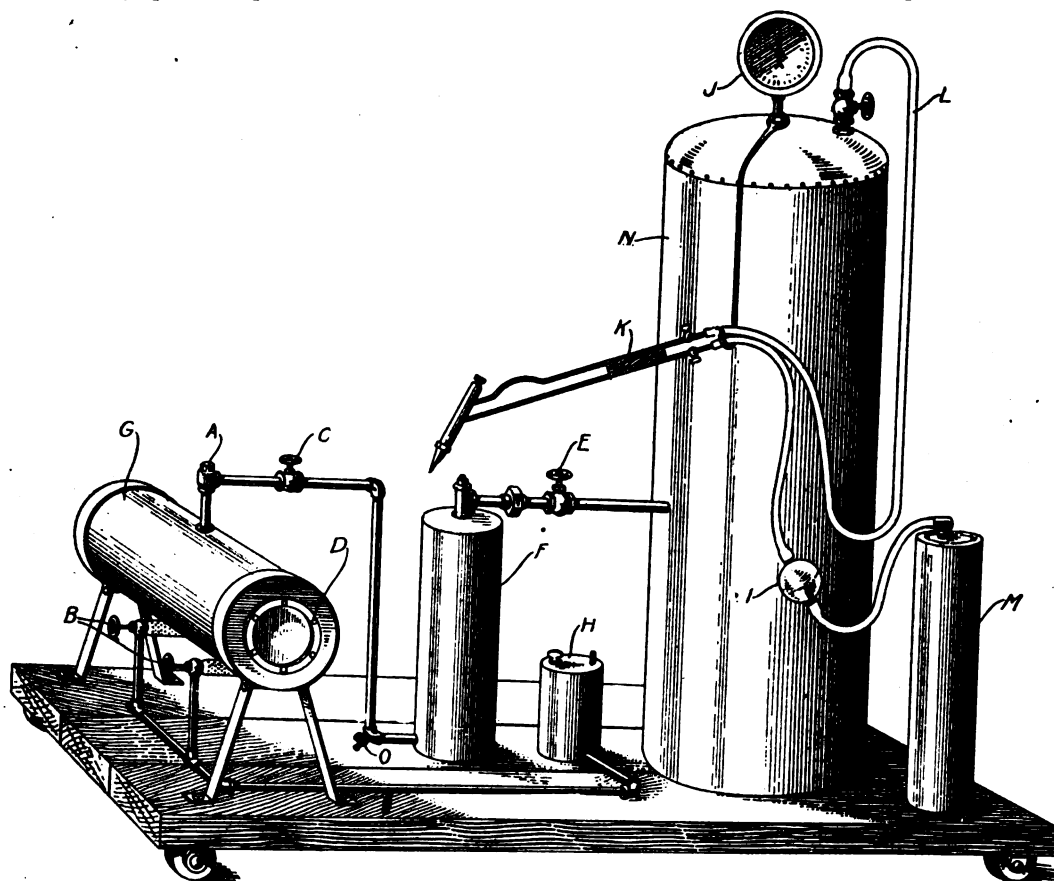


Fig. 1.

only fifteen or twenty pounds are necessary, but for safety it will be well to have the tank stronger.

The filter tank, or the tank containing the caustic soda solution will be taken in its turn. This little tank should hold three or four gallons, while only one gallon of the solution is necessary to a charge. This tank should have strength to withstand a pressure of two hundred pounds with safety. In the top of the tank F, should be screwed a short nipple and a T fitting. In the top of the T should be screwed a plug to allow of the solution to be put into the tank. In the pipe at the bottom of the tank F should be put a small cock O, to allow of the mixture to be drawn off. After leaving the tank F, there should be a union placed in the line as shown to allow the oxygen tank to be taken out to a job if necessary without moving the entire plant.

Next comes the globe needle valve E, which when closed prevents the gas from coming back from the oxygen tank when it is once stored. The large tank N, contains the oxygen. This tank as shown is a 52 gallon tank tested to 200 pounds. Into the top of this tank should be screwed a gauge J, which will show the pressure of oxygen on hand, and by this

A hose the same length should be attached to this tank. To prevent the water from interfering with the torch that accumulates in the hose leading from the acetylene tank I use a small filter I, made from a couple of copper oil cans. I cut the can in half and soldered it together and placed wool inside. This prevents moisture from effecting flame at the torch.

The entire plant should be placed on a plank platform which will allow of it being moved around. Many times it will be very profitable to take the machine to the work rather than to take the work to the machine. This platform should be set on wheels, or casters to allow turning about in any shape. After the platform is finished it adds much to the appearance of the entire outfit to give it a coat of paint. I painted the platform and oxygen generator black, and the balance of the outfit just as red as was possible to get it. The red attracted the attention of every one that came to the shop and they began to ask numerous questions, and when once you begin to explain the possibilities of the machine to a bunch of curious fellows there is sure to be one or two in the crowd that will have a job for you. What you want to do is to create an interest among the people

and your business will begin to pick up. All of the parts used in this machine can be purchased from the dealer who makes the smith territory, unless it is the pipe and caps used in the generator which can be purchased from a plumbing house.

In the manufacture of the torch some little pains must be exercised to get the best results. In the first place the body of the torch A is made of brass $\frac{3}{4}$ by 6 inches. Through the entire length should be drilled a $\frac{3}{8}$ inch hole. Into the top of this should be screwed a cleanout plug B. The bottom of this should be tapped a $\frac{1}{8}$ inch pipe thread to screw the welding tip C. Into the side of the body A, should be tapped at an angle of $\frac{1}{8}$ inch, brass pipe which the handle is made of as well as inlet passages for the gas to enter the torch. These pipes should be about 1 inch apart. The top pipe F, should be made in the shape shown in the drawing and have a small copper tube in the side to convey the oxygen to the tip before allowing it to be mixed with the acetylene gas G, as better re-

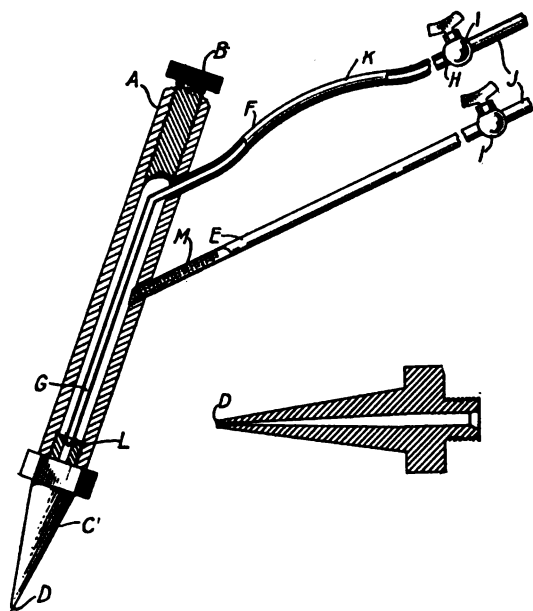


Fig. 2.

Fig. 3.

sults are obtained the closer to the tip the gases are mixed. The inside tube of the oxygen pipe should be brazed or fastened gas tight at the end of the pipe F, at H, where it enters the control valve. Each of the valves should have a control valve I. While it is not necessary to use the valves at all times, as the gas can be controlled at the tanks, many times a little variation of gas is necessary and it can be made at this point. The little hump in the oxygen tube K, is not a necessity but adds to the looks of the torch. A wooden handle can be fastened to the torch for a hand hold, as shown in Fig. 1 at K. The tip should be cupped to allow of the pointed end of the oxygen tube to come up as shown at L. The acetylene gas comes down tube E, passing through the fine gauze wire M, and passes out at the opening in the tip C, at D. This gauze in the line prevents the fire flashing back. The oxygen gas comes down the tube F, and sprays the oxygen into the tip at L. This action mixes the gases before they reach the tip D.

The tips, as shown at Fig. 3, are also made of brass. The inside opening should start to taper at the point it screws into the torch A, and continue to within an eighth of an inch of the end of the tip. The outlet D, in the tip should be small for light work and increase

in size according to the weight and size of the work to be welded, therefore, it is necessary to have a number of the tips on hand to be screwed on as the different weight jobs come into the shop. It would be a waste of gas to do a heavy job with a small tip and vice versa.

DIAGNOSING TROUBLES.

How Sound Faithfully Warns of Wear or Other Disarrangement.

From J. N. Bagley, Nebraska.—No one cares to drive a car that is rattling and squeaking along the street. To the man who knows, any noise save the hum of the gearing and the sound of the exhaust is abhorrent. Even the man who buys an old car begins to realize the grating and knocking before he has had the car long enough to do a decent job of steering. Naturally this fact helps to sell the new car, as all cars when new run reasonably silent. If, when the car wears out, it would only keep still about it, second-hand cars would demand a higher price than they do. A noisy car advertises its age and condition as surely as a profusion of sticks and feathers proclaim the period of a bird's nest.

A car that is correctly designed and assembled should make no noise save a hum of the gears and a click of the valves. The only other sound that does not denote wear at some point is the exhaust of the engine. The driver who is wholly satisfied with his car will hear just enough under the hood to assure him that all the cylinders of his engine are working perfectly and all parts are correctly adjusted. To the driver of long experience, that gentle rhythm is the most agreeable of all sounds, therefore, the man who cares can tell by sound. The most harrowing sound, mechanically speaking, is a sudden pound or grating whose source he has not located, but which he fears to find in the engine, transmission or rear assembly.

With the modern automobile of today there is very little breaking outright, but instead it wears out by degrees, or bends under normal stress. The little noises due to wear come gradually. If the driver can locate the wear by the sound he can usually tell about how serious it is, and about how much longer he can run the car before repairs are imperative. If, on the other hand, he cannot locate it by sound it may result disastrously when he is least expecting it. Many a crank shaft has broken because of a cut bearing, or gears stripped or broken by a clutch that "grabbed." Neglected minor noises may indicate loosened mud guards, a loose wind-shield, bolts working loose in their holes, joints about the springs and steering gear not properly lubricated, or the like. We may put all noises that develop suddenly and need attention in a class by themselves.

Nothing can take the place of personal experience in locating troubles in the motor car by sound. Consequently, the experienced driver, forewarned as to the probable meaning of certain sounds and symptoms, has a great advantage and may often avert repairs that are expensive by knowing exactly what to do under a given situation.

The first thing an experienced driver does when the unusual sound puts in its appearance is to locate it, since otherwise its importance cannot be found out, except it has gone too far to be repaired. A small squeak may be nothing more than a dry spring clip, or some little thing that can be stopped with a drop

of oil. On the other hand it might be something which if left run would cause a very expensive breakdown involving much expense and time.

On one occasion the writer had an occasion to look for one of those so-called "squeaks." It happened that it was near night when the traveler came into the garage. The car had been driven but little. He remarked that he had a squeak that he or no one else had been able to find, and it annoyed him considerably, and he wanted to know if I could find it. This squeak was only heard at times. So the next morning I went with him for a ride. I noticed that on level roads the squeak was not heard and with rough roads came the squeak also. It came from the front end of the car. I tried riding the hood, the fenders and the running boards, in fact I tried everything I could think of but could not locate it. Finally we drove back to the garage and stopped the engine. Standing on the running board and taking hold of the top and rocking the car, giving it about the same motion as we gave it over the rough roads the squeak could be heard. I finally located it in one of the stud bolts that held the shock absorber.

This same man today is an unusually good driver because he looks after these little things. If the car has just come from the repair shop, an unexplained squeak should be investigated promptly. Some bearing may be too tight or a shaft may be slightly out of line.

In case the knock is heard when the motor is running and the car standing still it will be traced to the pump, fan, magneto, clutch shaft or main bearings. While, if the noise is heard only when the car is in motion and the clutch engaged it will be traced to the transmission, back axle assembly, or the like. Occasionally, but rarely, the driving connection between the clutch and the transmission will be worn or loose and keep time with the cylinder and causes what sounds like an engine knock. With all these cases the sound is traced much the same as the physician traces a sound in the heart or lungs, i. e., by the use of a stethoscope or equivalent device. A flexible speaking tube, such as is used with office phonographs that works fairly well may be purchased at a very small cost. It is possible to use a soft pine stick, placing one end against the part where the knock sounds the nearest and the other end between the front teeth. It is well to make the test outside the building, as inside the echoes are more or less confusing.

Knocks that are due to loose crank or wrist pin bearings cannot be traced in the above manner. To locate a cylinder that is affected, cut out the spark from first one and the other until it is located. The knock, in most every case, will occur at the moment of the explosion, and cutting out the spark will stop it. When we have the cylinder we must determine which bearing is at fault. Now remove the dust pan and place a jack in such manner that it will lift upward against the main bearing. Work the jack very lightly up and down, while with the other hand you examine the bearing. Any looseness will be immediately apparent. To test the wrist pin, the fly wheel should be rocked gently with the cranks at half stroke. This will show the looseness, unless the rings are worn in such manner that the weight of the piston and rod overcome their friction. In this case grasp the connecting rod firmly with one hand and with the other examine the bearing as the connecting rod is worked up and down. This in most cases is rather difficult

owing to the fact that it is a hard place to get the hand, and if the other bearings have been gone over carefully and no fault found, the wrist pin is at fault. If the main bearings are slightly loose they may be adjusted by removing the shims.

Valves and Valve Noises.

Tests of different kinds have shown that noisy valves wear out sooner than quiet valves. I think the principal reason for this is the excessive clearance between the lifter and the cams. The cam movement is slowest at its inception, and quite a little more abrupt as the lift proceeds to its highest point. When the clearance is a matter of a few hundredths of an inch, which is all it should be, there is comparatively little shock when the cam comes up against the push-rod, but if the clearance is excessive it strikes a sharp, quick blow and it is only a matter of time until the side wear is excessive. The greater the clearance of the cam to the push rod the greater the wear at the side of the guide. At the present time we have few, if any, automobiles engines having cams formed for an excessive period of valve opening, and in particular cases the proper plan is to make the clearance as small as expansion and the possible irregularity of the cam itself will permit.

Noisy valves are objectionable for a number of reasons. They drown the more significant sounds of the engine or the opening of the valve, is affected until the proper charge of gas is not taken to the cylinder, and the burned gases are not expelled as they should be, resulting in a loss of power. A worn valve stem admits air between the stem and the guide to the combustion chamber making it impossible to throttle it down to a low speed. In case there is no adjustment to take up the clearance between the stem and push rod, one should remove the valve and draw the stem out until the correct amount of clearance is obtained. The end of the valve stem should be perfectly square, as otherwise as the valves turn around it will change the clearance between the stem and push rod. If one is in doubt whether a certain click is caused by the valve mechanism or in the connecting rod bearings, the point may be determined by cutting out the spark as described. A valve click will not stop when the spark is cut out.

The novice should be careful not to mistake sounds due to other causes for bearing knocks. As already stated, a looseness in the connection between the clutch and transmission will at times, get into time with a certain cylinder and cause a knock which in every instance will lead one to believe the knock has developed in the engine. Now, with the engine itself, missing in a certain cylinder produces a sound much resembling a bearing knock, but easily distinguished if the muffler cutout is opened.

A sound that is very hard to locate comes from one or two cylinders leaking compression while the others are tight. This sound, with the cutout open, much resembles the sound of the missing cylinder, with the exception that the engine works fairly well at a high rate of speed, but slows down with missing as the throttle is gradually closed. If one will take the crank in hand, with the switch open, and turn it over slow while the engine is yet hot, the cylinder failing to hold the compression will give a clue to the trouble. One will in this case notice that the spark plugs are about equally hot, which would not be the case with one or more cylinders missing.

A knock that is hard to locate comes from a worn

cam shaft; more often the shaft itself is worn, but in either the shaft or the bearing, the knock is a hard one to locate.

One should lose no time when unnatural sounds manifest themselves in the transmission or back axle assembly, and the hunt should not be given up until the part at fault is found and repaired. The clutch itself makes no noise, except a grinding noise in case of slipping or dry leather. A sprung shaft will lead to a noise of a pulsating character. In case the shaft bearings are loose a knock will be the result, combined with unpleasant grinding of gears.

A point where the working surfaces may get dry and suffer quite a little injury with little audible manifestation beyond a slight squeak, is found in the universal joint of a propellor shaft. The principal reason for this is the relative movement of the working parts are small and the pressures great. Squeaking from this point should have immediate attention. One can tell whether or not the trouble is in the universal joint by applying a little oil with the grease gun. The best lubricant for these bearings is the semi-liquid, as the motion of the parts will carry it between the working parts, while the lighter grease will run off, doing good only for the time being.

Strange noises coming from the back axle assembly have a meaning much stronger than some people imagine. The writer was called upon to diagnose a fault of "howling" in a back assembly. After riding a little way it was plain to see that something was wrong. After removing the cap from the housing and moving the gearing back and forth, we found that the thrust bearing holding the small drive pinion in mesh had backed off, allowing only the points of the teeth to nip those of the driven. This, while easily adjusted at the time, might if left, result in a very expensive repair. On a second occasion a car was brought to the shop which had a spell of sliding the hind wheels around the corner. I advised the driver that he would likely find the trouble in the differential gear, and it would be necessary to take the rear assembly down. He did not care to take the time to do it, as he had to use the car. He let the matter run for a couple of days, but when he came back the second time he was hauled in. He had allowed the trouble to run until the expense was ten times what it would have been if he had allowed me to repair it the first time he came to the shop. Some people pay dearly for an education in the school of experience, but fools will have no other.

Noises which do not emanate from the power plant or transmission system, are of subordinate importance, because while often they are quite annoying, they do not usually indicate any thing destructive to the car, as far as the working parts are concerned.

So long as we have the automobile in the hands of the "let it go" class there will be a number of dissatisfied users, and if the truth be known, the trouble can be traced to their own door.

New Ball Bearings.

A new anti-friction bearing has recently been placed on the market by the Suspension Roller Bearing Company, of Sandusky, Ohio. These are made both in roller and ball types under the name of Boyer Suspension Bearings, but special attention is called by the company to its ball type, which offers a remedy for crushing of the balls, rapid wear and the bad effects of grit accumulation in the raceways.

OPERATING ECONOMY.

Gasoline as a Fuel, Its Cost, Its Waste, and the Importance of Proper Carburetion.

By A. E. Potter. Read at the National Gas Engine Association Convention at Indianapolis, Dec. 5.

It is not generally to be supposed that the begoggled motorcyclist would be greatly interested in the subject of economy in the operation of his single- or twin-cylinder motor of few horsepower, but as a matter of fact he certainly is. The fortunate possessor of a small motorboat even, who thoroughly enjoys his week-end incursions and excursions, is considering more and more the extra expenditure of a few dollars during the season that might be saved by more careful adjustment of his carburetor, or a carbureting device that would conserve his fuel, and is looking to a decreased consumption of lubricating oil as well. Motorcars used solely for pleasure purposes, likewise motorboats of large power, are not usually operated with apparently utter disregard for either the cost or quantity of fuel or lubricants. In all these fields the cost of gasoline, measured by the carburetor efficiency, is a burning question, in more ways than one.

The growing use and adaptation of the internal combustion motor for industrial purposes depends very largely upon operative cost. This is especially true in the operation of taxicabs, motor 'buses and other motor-driven commercial vehicles; motorboats utilized for the transportation of passengers and merchandise, oyster cultivation and fishing; farm tractors used for various purposes besides drawing farm implements, and portable and stationary power plants. Quite naturally the greater the power the more important becomes economical operation.

The aviator's entire attention is given to the preservation of his life by keeping his motor in operation, and he is perfectly satisfied to pay prevailing prices for cold-drawn medicinal castor oil for lubrication purposes, it often costing twice as much or more as for the gasoline consumed. I think I am safe in saying that this is the only field not interested to any great extent in gasoline engine operating economy.

While gasoline is today the most expensive motor fuel used (with the sole exception of alcohol), it has the advantages of being convenient to use, clean and easily obtainable. Its sole disadvantage is in the matter of its soaring price.

As the principal item of expense in the production of power by means of gasoline internal combustion engines is that of fuel, anything that may be written looking to conserve gasoline is bound to demand attention.

It may not be generally known, but it is nevertheless true, that carburetors differ greatly in their consumption of fuel and that some carburetors can be adjusted to operate on materially less gasoline than others.

With a motor throttled to lowest speed the mixture has to be materially richer in gasoline vapor than when run at maximum speed, for two reasons; first, to allow for dilution of the charges of gas by air drawn into the inlet valve chest past the valve stem, which latter cannot be a tight fit in the guide, and second, for the reason that upon opening the throttle, before the engine can pick up speed, the velocity of the air through the carburetor is temporarily slower, resulting for a short time in a slightly weaker mixture. If this mixture is made very much poorer the motor will not pick up power, often noticeable in a motor-

car on a hill, and unless the speed lever is dropped back in such case the motor will be "stalled." If there is insufficient air velocity it is quite likely to result in an accumulation of unvaporized gasoline in the inlet manifold, and upon opening the throttle this raw gasoline is drawn into the cylinders, choking the motor with a gas so rich that it will not ignite, or upon ignition will produce very little power, and as in the former case it means dropping back to lower speed, or "stalling" the motor. In one case the mixture is too poor and in the other too rich, both to be avoided if possible, the latter being more important than the former, as it results in waste of gasoline. This latter condition is quite likely to be present in motors equipped with carburetors too large for the motor, always resulting in waste of fuel, no matter whether the mixture be too rich or too poor.

The first internal combustion engines using gasoline fuel were of the hit-and-miss governed type, and of these first, as they are still largely in use for stationary purposes.

While no great skill is needed to design a vaporizer or constant level carburetor that will operate an engine of this type, and that will allow of the development of rated and expected horsepower, to design such a device as will result in minimum consumption of fuel per horsepower hour delivered is not so easy, simple as it may seem.

The usual design of this class of devices is a straight pipe with a spraying nozzle entering the lower side, a pump to supply gasoline to a cup or bowl with an overflow back to the tank. This pipe may be the same size as the engine intake, or may be smaller, but never have I found a device of this kind employing the true Venturi principle—a principle that will give the air its maximum velocity to completely vaporize the gasoline without reducing the volume of each charge to such a point as to result in a reduction of power.

This type of engine, if properly designed, has a vaporizing device that will deliver maximum horsepower at a minimum consumption of gasoline, and when called upon for explosive charges intermittently the air has at all times practically the same velocity, and as a result the efficiency should be practically the same at high, low and intermediate speeds.

But with throttle-governed engines, no matter whether used in motorcar, motorboat, tractor, motorcycle, aeroplane, portable or stationary installations, conditions are such that marked fuel economy under varying power requirements is the exception, rather than the rule.

It is but reasonable to believe that the higher the air velocity the more completely will the gasoline be vaporized and the more intimately mixed with the air, with high efficiency the result. But on the other hand, in order to induce this high velocity the volume of the incoming charge may be reduced to such an extent that any loss as a result of imperfect vaporization and carburetion may be more than offset by a reduced horsepower output, and so long as there is a safe margin of power above greatest requirement such a condition would result in economical operation, but if extra demands are ever required of such an engine, its full rated horsepower, for instance, it would not be able to deliver any more power than an engine of relatively less piston displacement.

In order to overcome the above and other disadvantages, and to render such engines more efficient at varying speeds, they are usually equipped with auto-

matic carbureting devices. These may be broadly divided into three classes, viz.: those with proportional openings for air and gas; those that dilute a rich gas with atmospheric air; and those that adjust the amount of gasoline to an auxiliary supply of atmospheric air.

When properly proportioned to the demands of the engine, each class should show high efficiency. With engines that are not subjected to sudden and intermittent power demands, carburetors with proportional openings give fair results, but they seem to operate best with a mixture slightly rich in gasoline and are not generally recognized as being especially economical.

In the other two classes if the velocity of the air is too high there is likely to result a loss of volume and resulting drop in the horsepower delivered, while if too slow there is a strong probability that the gasoline will not be thoroughly broken up and mixed with the air with loss of efficiency, and the result is poor economy.

A series of tests of six different carburetors, conducted at Purdue University, and reported by Prof. George W. Monroe in a paper recently read before the American Society of Mechanical Engineers, shows marked differences in fuel consumption and power developed.

While these tests were recorded at 300, 400, 500, 600, 700, 800, 900, 1,000, 1,100 and 1,200 r.p.m., I will compare results at 600, 800, 1,000 and 1,200 only. At 600 r.p.m., the maximum horsepower developed was 19.53, the carburetor showing an efficiency of 17.4 per cent., this being the highest efficiency shown by any carburetor at that speed, while the minimum horsepower recorded was 14.898, with but 14.3 per cent. efficiency. Efficiency was based on an assumed fuel value of 20,700 B.T.U. per pound, and I am assuming this fuel value in all future comparisons.

At 800 r.p.m. the carburetor showing also the greatest horsepower at 600, delivered 25.01 horsepower, the same horsepower with an efficiency of 15 per cent. that another showed with an efficiency of but 14.4 per cent.

At 1,000 r.p.m. the efficiency of this last carburetor increased to but 14.5 per cent., delivering the same horsepower as two others showing respectively 19.5 and 20.5 per cent. efficiency, while the carburetor showing greatest horsepower at 600 and 800 showed 30.441 horsepower with an efficiency of 17.5 per cent. Another showed the same horsepower at an efficiency of 19.3 per cent.

It was at 1,200 r.p.m., about the speed at which the engine should have shown its best, that the greatest disparities were apparent, three different carburetors showing the same horsepower delivered, while their efficiency percentages were respectively 15.5, 22.2 and 15.3 per cent., the consumption of gasoline being proportional to these different percentages. Here is an engine delivering the same horsepower with three different carburetors, consuming respectively 25.8, 18.0 and 26.1 pounds of gasoline per hour, approximately 4.3, 3, and 4.35 gallons, the best economy being .74 pint per horsepower hour, and the most uneconomical nearly 1.07 pints per horsepower per hour.

It is safe to assume that all these carburetors were adjusted to do their very best at high speed, and that any increase of fuel in the carburetor showing highest efficiency would have shown loss of power, while any decrease in fuel in either of the other two would likewise have lessened the horsepower. No matter

what caused the various efficiency results it is very evident that in each case the gasoline entered the engine cylinders in most combustible proportions for each carburetor, was burned therein, and the products of combustion were exhausted in the regular cycle of the engine, and in neither instance could the mixture have been made richer or weaker without loss of horsepower. The plausible theory, to me at least, is that the gasoline was less perfectly vaporized and mixed in one instance than in either of the other two, the result of a lower air velocity with slightly more volume, rather than a somewhat decreased volume due to increased air velocity, the mixture being un-uniform, and the gasoline itself not finely divided. Dr. Dugald Clerk, the well-known English authority on internal combustion engines, recently conducted a series of tests to determine the length of time of an explosion of a 10 per cent. mixture of coal gas and air. The results obtained showed that the gaseous mixture in a state of turbulence was exploded in .03 second, being thus shortened from .13 second on raising the speed of the fan from 2,000 to 4,500 r.p.m. This seems to coincide with the theory I have advanced.

If this hypothesis is true, a vacuum gauge attached to the engine manifold should have shown a higher reading when the engine was being operated by means of the most economical carburetor, and lower with both the others.

Some time ago I had occasion to test out a new carburetor on a four-cylinder medium-speed engine, with valve setting for about 800 r.p.m. normal running.

At 770 r.p.m. a mean effective pressure, reduced from dynamometer reading, was shown of 73.8 lbs., with a consumption efficiency of 17.68 per cent., while at 600 r.p.m. the efficiency was reduced to 14.13. The mean effective pressure also dropped to 66.5, and yet at 1,000 r.p.m. the efficiency percentage rose to 19.95, the mean effective pressure, however, falling to 70.2 lbs. In this case the carburetor should have shown highest efficiency at about 800 r.p.m., assuming that the valve timing was correct at that speed from the high mean effective pressure recorded. The construction of the carburetor was such that there was a higher air velocity at 1,000 r.p.m., resulting in increased efficiency at that speed, while the slower air velocity at 770 r.p.m. reduced the efficiency to 17.68 per cent. at which point it should have been about the highest, and where it would have been had the fixed air inlet opening been slightly reduced in area, to give higher air velocity past the vaporizing nozzle.

Almost anyone who has conducted fuel consumption tests of gasoline engines has noted practically similar results to these few I have mentioned, but no one who makes comparative carburetor tests, and who relies entirely upon the horsepower delivered at different speeds, can have any conception or idea of an engine's fuel efficiency, except he makes fuel consumption tests in addition, to taking the horsepower readings at all speeds from the minimum desired to the maximum at which the engine may be called upon to be operated.

There is one other patent cause of waste of gasoline which deserves brief mention at this time. This is the timing of the engine. To ignite an engine any later than this will give maximum power means waste of fuel. The earlier the ignition can be set without knocking, the nearer closed can be the throttle, and to this I may add, the more synchronous the timing

the earlier it can be set. It is admitted by all that a single spark occurring with absolute regularity, not early and late intermittently, as may occur in a single-cylinder engine with parts badly worn or with loose timing apparatus, will develop more power than a series of sparks which may or may not be timed to begin at absolutely the same instant every time when called upon to furnish ignition. In like manner a timer that does not have its contacts spaced absolutely correctly may cause the ignition to occur early in one cylinder if a multi-cylinder engine, while one or all the others may get the spark materially later.

A short time ago I was asked whether or not a high-tension magneto would give higher speed to a four-cylinder marine engine operating at about 400 r.p.m. than a single spark well-known battery system. My reply was that if the break of contact at the interrupter was timed as absolutely correctly in the magneto as the slots in the revolving timing head were milled, there should be no difference. Upon installing the magneto the battery system was found to deliver some 5 per cent. more power, higher speed than the magneto, due without question to the more synchronous timing.

The question of gasoline engine operating economy, therefore, seems to me to resolve itself into four channels of careful, intelligent thought, viz.:

- 1st. The proper proportioning of the carburetor to the engine, being neither too large nor too small.
- 2nd. Proper carburetor adjustment.
- 3rd. The elimination of all carbureting devices that waste fuel.
- 4th. Synchronous and as early timing as is consistent with intelligent operation.

Care of Tires.

"It used to be the contention of expert repair men," says J. M. Gilbert, general manager of the United States Tire Company, "that about fifty per cent. of the pneumatic tires consigned to a final resting place on the junk-heap were not actually worn out but had succumbed to the deteriorating influences of abuse or neglect, perhaps both.

"The reasons for this regrettable waste were not difficult to determine.

"In the first place, the average motorist began the operation of his car in complete ignorance of the requirements of his tires. When he decided that the logical moment had arrived for him to invest in a motor car he assiduously familiarized himself with the mechanical details of the car for the very obvious reason that it was vitally important to him that he should be able to keep the engine running under all circumstances.

"But when it came to the tires, well, he dismissed them from his mind (if he thought of them at all), with the assumption that until something happened—a puncture or a blowout—they required no attention. The tires suffered in consequence and did not yield anywhere near the mileage service they were capable of.

"It would be silly to contend that all motorists, even now, are as careful of their tires as they should be. However, the general trend is toward a more thorough understanding of tire construction and a deeper appreciation of tire requirements. The result is that whereas a few years ago half of the money expended for tires was wantonly wasted, the percentage of waste at this time is decidedly less."



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1024 An Annoying Noise.

From Oscar O. Knight, Michigan.—I have a 1912 Buick Model 27 car. It has run splendidly up to about the middle of the summer. In fact, it runs good yet, but it has a little noise that is quite annoying at times. It sounds as if the wheel of the engine were striking the pan below. But it only does this when pulling heavily or is throttled quickly while on the road. When the engine is running idle you cannot hear it. The only time it makes that noise is when the engine is laboring. I have looked between the wheel of the engine and the pan below, but it does not touch there although the sound is very much as if it did. I have looked all over the car but cannot locate the offensive tick, tick, tick, when it is laboring. Otherwise it runs fine. Please give me some light on this if possible.

Reply.—We regret that we are unable to give you any great help, at best being able to do little but hazard a guess as to the cause of your trouble. It may be that your ignition is too early on one or all cylinders, judging from what you say as to this symptom appearing when the throttle is quickly closed, the click being caused by preignition. It may be caused by any one of a dozen or more conditions, such as a broken piston ring, side motion of the upper end of a connecting rod, etc.

1025 Engine Misfires.

From J. C. Miller, Wisconsin.—I am in trouble with my No. 10 Buick car of 1910. It bothers missing when running anywhere below 15 miles an hour, but when running 18 or 20 miles it seems to run fine. The car has not run over 3,500 miles and is not worn any to speak of. It is equipped with a Remy S magneto and coil, A C spark plugs, and I think Model D Schebler carburetor. There is good compression on all cylinders, the carbon has been cleaned out, the valves ground, the spark plugs cleaned, the manifold examined, but find no leaks or anything wrong anywhere. I had an expert do all this. We even put on a Model L Schebler carburetor and took the magneto and coil off another car that runs fine. All the wiring is in good shape but nothing seems to remedy our trouble. I thought it was in the front cylinder, as that plug would foul up, but today I used the car and the two rear cylinder plugs fouled up and the others were perfectly clean. The plugs that foul up are not oily; they are just covered with a dry black soot. If you can give me any information I certainly will appreciate it.

Reply.—The Schebler D carburetor is not so well

adapted to your car as the Model F, L or O would be, but the fact that you have tried out a Model L carburetor and magneto and coil from another car would seem to indicate that the trouble is caused by excessive lubrication, quite likely caused by poorly fitting pistons and rings which allow the oil to pass when the engine is throttled. A reduced amount of a thicker oil may remedy the trouble. You should remember that missing explosions will cause accumulations of soot on the plugs, and that accumulations of soot due to excess lubricating oil will cause missing. Leaks of air past the inlet valve stems may impoverish the mixture to such an extent that missing begins on low speed and the oil does the rest. Your motor is three years old and it would not surprise us if you found the inlet valve stems fitting loosely. Weakened exhaust valve springs might also cause the missing at low speeds.

1026 Two Reo Runabouts.

From Fritz S. Pehrson, Iowa.—I have two Reo runabouts, single cylinder; one Model B, 1906, and one Model G, 1910. The model G, 1910, has a rumbling or boiling sound in the cylinder most always when run any length of time. I think the pump works as the tank and radiator get hot, but it does not boil or steam in the water tank. What do you think is the matter? The Model B, 1906, will not take hold, or pick up, on high speed on the level (though the engine has plenty of motion) until it has gone 6 or 7 rods, and on the least upward grade will not pick up at all, although the engine is running fast. I have tightened the high speed clutch as tight as it will stand. It does not slip on the coin collar or clutch lever. It slips inside of the transmission. Please let me know what you think of the trouble? Could you inform me where I could buy brass tubing in sizes from $\frac{3}{8}$ to 1 inch thick?

Reply.—Your pump probably does not work to its full capacity. Water used for cooling the cylinders must circulate rapidly in order to give up its heat by radiation through the walls of the radiator. If the water boils and steams in the cylinder it certainly ought to give off steam from the radiator. The Model B of 1906 has probably nearly outlived its period of usefulness, so far as the clutch is concerned. The only remedy is to have worn parts renewed, having them made if you cannot purchase replacements from the manufacturers of the car. You can purchase seamless brass tubing from almost any dealer or jobber in plumbers' supplies in any city of reasonable size. Tubing is measured by its outside diameter and the thickness of its wall, while brass steam pipe is measured by its nominal inside diameter, a little larger than iron steam pipe, and the outside diameter practically the same. We presume you refer to diameter when you say "thick."

1027 Faulty Carburetion.

From E. L. S., Montana.—Have a Ford Model T Touring, 1912, Holley carburetor. Have run car about 10 months. Until the last two months have been getting 18 to 20 miles per gallon of gasoline. At present only get 11 or 12, in spite of the fact that roads are in better condition than any time of year. The carburetor leaks; that is about a tablespoonful will collect under it, after it has stood all night. After it has warmed up in the day time I do not notice any leaking. Engine runs fine; have lots of power and

speed. Have had carburetor apart; valves seem tight, float seems O. K. In fact except for the excessive consumption of gasoline, would not know that there was anything wrong with it, except also the leak I spoke about above. Have a gasoline gauge on the car, and when the gasoline is left turned on will probably leak about $\frac{1}{4}$ gallon during the night. I want to change my front wheels to same size as rear. What is the correct procedure? The factory declined to advise me in the matter.

Reply.—Either the float is adjusted too low, is loaded with gasoline or the needle float valve needs regrinding, any one or a combination of which would cause the leak of gasoline which is a potent element of danger. If the Ford Motor Company refuses to advise you as to change of size of front wheels, we would hardly care to offer any suggestion to that end. They undoubtedly have an excellent reason for declining.

1028

Overheating.

From F. G. M. (No State Given).—I have a Model T Ford car, 1912, and am bothered considerably with the motor heating and the water boiling in the radiator. I have cleaned the radiator and scraped the carbon from the cylinders. I have also changed the oil and the muffler is clean. The mixture seems to be in good shape. Could you give me some information on the subject? It seems to me that the lubricating system does not feed enough oil, but I may be wrong.

Reply.—Your inquiry gives us very little information. In general such conditions as you mention are usually caused by too late a spark, too rich a mixture, circulation impeded by accumulation of scale or foreign matter in the radiator, poorly fitting pistons allowing pressure to pass to the crank case, leaky valves, poor oil, etc. We do not think in your case there is insufficient lubrication if you follow instructions of the manufacturer.

1029

Why It Does Not Start.

From E. P. Mulford, New York.—I have a two-cylinder car, 12 h.p. Thinking to remove the carbon from the valves and improve things generally, I filled the cylinders full of kerosene oil and let it stand about a week. Before I did this the engine ran all right and since I did it I cannot start the engine at all. The spark is all right and will burn the mixture when the plug is out, but prime it as much as you like you cannot get a bump. My curiosity is aroused. Will you tell me why the engine will not start?

Reply.—We presume, although you do not so state, that your engine is of the vertical pattern, although it may be horizontal double-opposed. The fact that the spark "will burn the mixture when the plug is out" would seem to indicate too rich a mixture, gasoline and kerosene mixed as a result of the very heroic treatment received at your hands. A tablespoonful of kerosene put into each cylinder while hot would have been ample. We are afraid you will find it necessary to take the cylinders off, clean out the loosened carbon and then apply some cylinder oil to the cylinder walls, pistons and rings to replace the oil cut out by the kerosene. If your valves are tight and your compression is any way impaired it indicates leak of pressure past the rings. Cylinder oil assists, particularly in an old engine, to improve compression by its "pack," as it is called, filling the interstices and irregularities in the surfaces of both cylinder walls and pistons. The effect of loosening up and dissolv-

ing carbon accumulations as you have probably done, is not dissimilar to the effect on a steam boiler of feeding an inordinate amount of scale remover, loosened it up all at once instead of gradually.

1030

Lost Power and Noise.

From R. C. Davis, Nebraska.—I own and operate a 38 Overland car which is about four years old. It is losing its power some way. When running it has a "woo-woo" noise that I don't think it should have. I have lately put new rings in it which increased its power some. When I advance the spark about one-third the sparks all jump off the magneto on the guiding wheel stem, and the motor slows down. If I advance the spark two-thirds, or three-quarters, the engine starts up again. I can run along very well on ordinary level roads, but cannot get up much of a hill on high-speed. The cables that lead from the magneto and also the three wire cables that lead from the magneto to the coil box are thoroughly soaked with oil. Does that do any harm? It has a Remy magneto and a Schebler carburetor. The spark plugs and valves foul badly and it cranks hard. Can you advise me what to do to help the running of my car?

Reply.—You have practically admitted that your compression is not as good as it should be. This and the fact that your spark plugs soot up badly leads us to believe that your cylinders or pistons, or possibly both are badly worn, which means either new cylinders, new pistons or both. You say nothing about valves, so we presume there is no leak of compression there, although such a condition is likely. You undoubtedly need to have the wiring renewed throughout by some one who knows what cable to select and how to do it. You have probably a Schebler Model D carburetor which will not vaporize the heavy gasoline of today as more improved models of Schebler and other makes.

1031

Trouble with a Truck.

From John A. Smith, Massachusetts.—I have a two-cylinder opposed 19 h.p. Sampson truck, bought new September, 1912. It chops when starting but after running fifteen miles per hour it goes all right. It pulls good as long as it is running fast. It will run idle and not chop but when given the throttle will hit on one cylinder for a few seconds and then go pretty good. It has a Splitdorff system, Stromberg carburetor, trimming is right, have had different size spray nozzles, the smaller sized nozzle seemed to help for a time. Last week we put on a Schebler carburetor but the trouble is still there. It seems to go better with the carburetor that came on the car.

Reply.—We have to confess that we are not just sure of what you mean by "chops" and "trimming," but assume the former to indicate skipping explosions and the latter carburetor adjustment. With this understanding on our part we will try to answer this query. The skipping at low speeds is probably due to one of two causes, the first a richer mixture of gas being supplied to one cylinder than to the other and the other an excess of lubricating oil in the cylinder in which occurs the missing of explosions. These two conditions are frequently present in double-opposed motors, the former due to the longer length of inlet piping to one cylinder than to the other with consequent liability of condensation of gasoline in the piping and the other to the fact that more oil is thrown by the lower end of the connecting rod as it rises from

the oil than on its passage from its highest to lowest position. As contributory conditions, colder weather and heavy gasoline, harder to vaporize, must be considered. If the trouble is due to faulty carburetion a hot air lead or higher velocity to the fixed air would be liable to help matters. This is a case where the experience of the manufacturer's engineering department should be drawn upon, as it is but to be surmised that they have had similar complaints from other owners and operators.

1032 **Wheels and Axles.**

From D. W. H., Virginia.—(1) I have a Moline 30. The front axle is slightly bent. Is there any rule to go by to straighten it? That is, should the wheels set in at the bottom? I see so many cars where the front wheels are out at the top and in at the bottom. Should they be that way?

(2) Will a car lead to one side if the front axle is bent, and will it go towards the side that is bent, or the straight side?

Reply.—1.—Most automobiles have an apparent inclination of the wheels, as you state. This is done to balance the dishing of the spokes by bringing the lowest spokes into a vertical position.

2.—A car will slightly turn to one side if the front axle is bent. This inclination to do so depending, of course, upon the amount of the bend. It will go toward the side that is bent and not toward the straight side.

1033 **A Worn Bushing.**

From A. M., New Jersey.—My 1912 Ford car always seems to be in high gear. When I go to start it as soon as I start to turn it over it crawls towards me. If I jack it up and crank it, letting it run till warmed up, then let it down, then it will be in neutral, so that I can crank it without this trouble, now if I let it stand for an hour or so have the same trouble with it being in high gear. I took off the transmission cover with the lever at neutral with the transmission shift clutch away from the fingers, and had a friend turn it over, and the whole car moved along towards the man cranking it, so we jacked it up, cranked it at neutral and it started off in high speed, then placed the high speed lever in and the wheel did not go any faster. (When it started off in high speed the fingers were all loose with $\frac{1}{4}$ of an inch from clutch shift.) With the car standing still, not running, and the speed lever in high, if I shake the slow speed pedal the transmission will slide from front to back possibly $\frac{1}{8}$ of an inch. Have also lengthened the slow speed clevis also screw on clutch pedal to keep it neutral. When running, if I stop at a store, I must have the emergency brake set, or it will move along slowly. When I am sitting in the car and it is stationary with the engine running idle I can hear a thump in the transmission which sounds like when I am working the slow pedal (with engine not running but lever in high) and the transmission sliding back and forward for an $\frac{1}{8}$ of an inch. My car has always had a tendency to creep forward, but by putting a brick in front of a wheel I have had no difficulty as it was all right to turn over, but now it is absolutely impossible to turn it over at all unless it is jacked up as it is always in high gear. I have drained all the oil out, put in a gallon kerosene, turned it over a number of times, drained and put in fresh oil, started it, let it stand awhile; same trouble as before. Have asked Ford agents. They say there must

be some trouble inside; of course I know this myself. It stumps me without it is a bushing that is worn. Have owned two other cars, Buick and Maxwell, and always do my own repairs.

Reply.—Your clutch drags at high speed, probably due to a worn bushing, as you have diagnosed the trouble, as there should not be any end play noticeable. This trouble should be given attention at once, or your entire transmission may have to be renewed.

1034 **Car Has Lost Power.**

From A. W. Stipek, Connecticut.—My car is a Ford Model T, 1910-1911. I cannot get more than 30 miles an hour; when new 35 miles. Compression is very good; I grind the valves about every 600 miles; plenty of power (hit four at all times); Jacobson-Brandow coil; new timer; wires all secure; Kingston carburetor (cannot feed less gas); no difference from magneto to battery. This coil, I believe, is slower than some others on the market; that is, the vibrators work slower (cannot adjust them any lighter). I think I want either a new coil or a master vibrator. Will a master vibrator give me more speed through the old coil, or is it necessary to get a faster coil to get more speed?

Reply.—If your compression is at all impaired, due to wear of pistons, rings or cylinders you should not expect your car to run as well as when new. If you install a master vibrator you must screw the vibrator adjusting screws down tight on each of your coil units, so that the primary circuit will not be broken at the individual vibrator contact points. Sometimes blocks of fibre are interposed between the core and vibrator armature to keep the points in contact. The object of a master vibrator is to insure the same vibrator adjustment for each coil unit, with more synchronous ignition as a desired result. By synchronous ignition is meant the same advance or timing in each cylinder, rather than a condition where one or more cylinders fire early and one or more late. If you purchase a new four-cylinder coil you should not select one with vibrators, but one for use with a master vibrator. The new Model Y Kingston carburetor, with which 1913 Ford cars are now being equipped, seems to give much better results than the older models. The speed of a coil depends very largely upon the speed of the vibrator. The less lightly adjusted the greater the current economy, while the closer the contacts are adjusted the greater the current consumption, and usually the hotter the spark and the quicker its operation.

1035 **Sliding Gear Howls.**

From E. B. B., Oklahoma.—My car is a Maxwell, 30 h.p., Model F. I have a howling sliding gear transmission. When I am running on high speed my gears are quiet, but my second speed is very noisy. I find the counter-shaft has quite a lot of play, which seems to be in the front end bearings. Now, what I would like to know is, can my counter-shaft be gotten out, and after I get it out, what kind of a bearing is on the forward end of the counter-shaft? I have a repair catalogue of the Maxwell car, but it does not explain this line-up, and I do not care to tear this part down until I am in a position to improve the conditions.

I would also like to have the best recipe that you have for preparing a grease for my sliding gears as a lubricant, and something that I may add to quiet the sound of the gears.

Reply.—When on high speed your engine is direct

—connected, the counter shaft runs idle and, doing no work, is practically noiseless. When on second speed the gears are running off their pitch lines, due to the worn bearings. It is not a difficult matter to replace countershaft bearings. It will be necessary to disassemble the gear case, when the method of removing the counter shaft will be found a simple matter. You should order new bushings for both ends of the counter shaft, giving the number of the car when ordering. You would be unwise to attempt to compound a grease for use in your transmission when practically every garage carries standard makes of gear greases in stock. Do not attempt to cure your trouble with grease, but renew the bushings before you need a new gear case, gears and all.

1036

The Question of Power.

From P. G. Liederbach, North Dakota.—Please answer the following. I think it will be of general interest to the readers of your paper. I have been reading different papers, but have never seen this question discussed in them.

One prominent steam engine builder catalogues his engine 32,110, meaning that his engine is 110 h.p. in the belt and 32 at the drawbar, $110 \div 32 = 34.37$ per cent. efficiency.

Another prominent company making gas tractors call their tractor 30-60, meaning that their tractor is 60 in the belt and 30 at the drawbar, showing an efficiency of 50 per cent.

Again an automobile builder puts a motor into his chassis that is $4\frac{1}{2} \times 4\frac{1}{2}$; he calls it a square motor. The R. A. C. formula used by Great Britain is the same as our A. L. A. M. This motor shows a horsepower of 32.4. Now if this automobile is called a 32, what is its power at the rear wheels? We know that there is a loss of power. Or, in other words, there is power used up in transmission, and it takes power to move the weight of the car, and the heavier the car is the more of the motor's power is required to move it. I will say that this car weighs 3,000 pounds. What I would like to know is what the efficiency of this car is? Of course, we will assume the gear shifting lever is in direct drive.

If a certain per cent. of this 32.4 h.p. is available at the rear wheels on direct drive, what per cent. is available on 2d and 3d speed? Of course, the motor has greater purchase on 2d and 3d speed, but the car moves slower. I will say that the gear ratio is on direct 1 to $3\frac{1}{2}$, on second 1 to 7, and on third 1 to 11.

Reply.—Although the information given by horsepower formulas is not absolute nor even comparatively relative, one car with another, the one used by the A. L. A. M. is quite likely as fair as anything else that can easily be devised. It should be remembered that the actual power of the car is not the rated power of the engine, but the amount of energy exerted at the point of contact between the traction members and the ground. In some cars there may be a loss of 25 per cent. in power transmission to the rear wheels and in others there may not be more than 10 per cent. There is no way to determine the actual power delivered to the shaft except by making a brake test.

Why He Has No Trouble.

From A. B. Roberts, Connecticut.—For the benefit of "Willie Grouch," "W. F. G." and others, I will say that I have driven my 1912 Model T Ford car nearly 3000 miles and have had no trouble whatever. I have not had to improve any of the points of the car as

W. F. G. says. I have had two other cars of standard makes, both considerably higher in price than the Ford, and have derived much more pleasure and satisfaction from my Ford than from my two previous cars.

In regard to the improper assembling of the drive shaft roller bearing of "W. F. G.'s" car, I had a personal experience with an equally bad case of blundering in one of my other cars. In less than a month after I had purchased the car new, the differential gears cut out by reason of the fact that in assembling the gears at the factory no grease was put in. As F. R. Marrs says, there is no car that has not fallen down in some instance at some particular point. Have had no trouble with grease working out of the rear hubs. I use a moderate amount of cup grease in the differential. I am convinced that trouble in this respect is caused by using too great quantities of too light a grease. I have had no trouble in starting on cold mornings. My process is as follows: I crank the motor a few times with the air intake of the carburetor closed and the switch off. Then by turning on the switch I can start the motor with one or two turns. Am using the same spark plugs that came in my car, though unlike the friends of "Willie Grouch," I learned what a spark plug looks like several years ago. Of course, no reasonable person expects to get Two Thousand Dollars value in a car sold for Six Hundred Dollars, but for any one who desires a good, serviceable car, with low cost of upkeep, I can heartily recommend the Ford.

Overheating.

From Irving Seavey, Maine.—I note your reply No. 1011 to J. G. Gompert, of Nebraska, in your November issue. I do not agree with you in the statement that a mixture too thin can not cause overheating. I fully believe it can. I have had trouble enough and have done experimenting enough along this line so that I believe there is little question about it. I would be glad to see this question discussed further in your columns. One experiment that first influenced me in this belief was made about two months ago. I had previously had considerable trouble with my engine overheating. Before starting on a ten mile run over a good road with a full load I changed the carburetor to admit a little more gasoline than usual. The engine had been heating badly that day and on this run I drove it hard and arrived at the end of the ten miles with engine in fine condition with no indication of overheating. I turned it around and with the same load and gasoline turned off a quarter turn from where it was before, covered the same ground in about the same time. Water in the radiator boiling at the end of the ten miles.

Following this experiment I made quite a good many more and always with the same result. I will admit that I had the idea so firmly fixed in my head that a too thin mixture would not cause overheating that it took considerable experimenting to fully convince me that it would.

Any further discussion you may be able to bring about in your columns on this subject I would be glad to read and I feel sure you have many other subscribers who would too.

Ford Oiling System.

From C. D. Oldknow, Pennsylvania.—Referring to the question of the advisability of cutting the "dips" from piston rods and removing the partition between the oil pan and the flywheel pit in the Ford Model T motors, made previous to 1911, I beg to say a branch

manager of the Ford Company is credited with the statement that the builders have found that their oiling system was over-done and "splashed" too much oil, and have instructed all interested to cut off the dips and remove the partition. The builders are now, and have been, omitting the dips and the partition and also working less clearance under the rods, all to prevent too much oil splash.

It cannot possibly harm the rods to file off the dips and as the partition referred to is only a piece of thin sheet iron soldered in the crank case, it certainly does not weaken the same to remove it. In many sections of this State, garage men as well as owners, say the same thing and found relief only after the dips and partition were removed, and the writer is one of them. Instead of a "spray" of oil cast by the revolving rods, as was intended, the effect was "spoon-fuls" and the Ford people were not long to remedy and correct the cause.

We agree with the note of answer to this question in your last issue, that it is not wise to make alterations to a car, since so many able engineers have studied the best design and turned out what they believe to be the best construction, but we do think it safe to make any change that practice and use have proven necessary and led the builders to change. Therefore, if the builders have changed the model, why advise the owner of an earlier model not to?

Now, Mr. Editor acknowledge you were wrong and we will forgive you.

(Reply.—We hereby acknowledge.—Editor.)

WHAT IS A GUARANTEE WORTH?

Both Sides Presented of a Decidedly Two-Sided and Perplexing Question.

From J. W. Hadley, M.D., Maine.—To the prospective buyer of any goods for service I contend that this question is of considerable importance aside from the financial part of it. To invest in any guaranteed article and have it prove poor or even useless puts the purchaser at a disadvantage even if the manufacturer replaces gratis the defective article in whole or in part. The readers of this journal may say that I have a grouch, but listen while I will a "plain unvarnished tale unfold."

My troubles began when, in 1908, I became the happy possessor of a Maxwell Model A shod with a well-known brand of tires. With this car I was given a written guarantee for the tires to do five thousand miles unless run flat, punctured or cut. Before I had run twelve hundred miles one of these tires blew out at the side. I immediately sent this tire to the factory and in the meantime had to part with good money for a new tire to keep the car going. After about two weeks I received the tire back. A piece of canvas had been cemented on the inside and the hole vulcanized quite neatly on the outside. The factory said this was the best they could do for me and considering that no charge was made thought I was being treated very fairly. The expressage amounted to one dollar and seventy-five cents and for that amount I could have had the job done nearby. I got less than one hundred miles more out of that tire when it went to pieces much like the traditional one-horse shay. Very shortly the other tires on that car went the same way as the first except that they did not get back to the factory. There is an old saying "bought wit is the best if not bought

too dear." I considered that I had bought some any way. It is safe to assume that I would not now put this make of tire on my car if anyone would give it to me. I wouldn't wish to be annoyed.

Next in 1910 I bought a new Ford touring car shod with another standard make of tires. The third morning after getting it home on going to the garage I found a rear tire flat. On removing the casing a small hole was discovered in the tube next the rim. Casing intact. Having mended many nail punctures and even blowouts with ordinary cement and patch I very courageously proceeded in this way to repair the tube. When all was finished, with much confidence, I replaced the tube and inflated the tire. In about thirty minutes that tire was flat. Off it came again and I found that the rubber had torn out under the patch until the small hole was a slit nearly an inch long.

Four times I repeated the above performance before I gave up in disgust and out in a tube of a different make. The defective one I sent to the factory. They vulcanized a patch on and sent it back. Expressage cost me one dollar and thirty cents. Could have had it done here for fifty cents. I put the tube back in casing and inflated. I think that tire staid up long enough for me to get my overalls off and wash my hands. On removing the tube I found the same condition as at first in another place. Tried to patch it with the same results as before. Finally had another patch vulcanized on. On inflating this remained up over night. More holes. While I was ruminating on what I had better do, the other rear tube went like the one described. I wrote the company who stoutly maintained that the tubes were O. K. and tried to put the trouble into "side strips" whatever they are or something else which my wheels did not have and which I have never been able to find on any. Finally I offered to give them the two tubes for one but could get no satisfaction whatever and sold them at once to the junk man. I don't know whether he got sold or not. The tube which replaced the first one is still doing service after nine hundred miles and having been patched on the road for a blow-out. I think the deductions from the above are patent to anyone.

Recently I bought a rear tire of still another well known brand, guaranteed thirty-five hundred miles. Before I had run twenty-five miles the canvas began to show on the side where it was lapped and pulled apart and the rubber had not enough life to stretch. Soon another worse place appeared and I had to put on a tire band to prevent a blow-out. I was not where I could dispense with the tire and so had to run it that way for several hundred miles looking at it occasionally to see that no new bad places appeared. Finally sent it to the factory. They offered me a new tire in exchange for fifteen dollars. This one cost nineteen dollars and thirty-five cents. I offered five dollars which they have decided to take. Have not yet received it although it has been nearly a month since the old tire was sent back. When I pay the expressage it will make my tire cost for one tire along amount to about seven cents per mile, while my tire cost for last two years has been only a little over one cent per mile for all four.

What I would like to know is how long is this kind of business going to continue, and is there no way of causing it to be abolished? Manufacturers of guaranteed goods set the price high enough to cover the cost of replacements if any have to be made. This is reckoned in with the "overhead expenses." If they

have not got it high enough yet, put the price up a little but give us what we pay for.

I read in a book "a sucker is born every minute and two to catch him." It seems about that way. We buy A's guaranteed tire and pay good money. It proves useless or worse. We ask for it to be made good and get very little satisfaction. We drop that make of tire and buy one of B's. If it happens to prove good, all right. Perhaps some other fellow will have had bad results with B's goods. He gets no satisfaction and drops B's and buys A's which may give him good service. Manufacturers cannot be so dull as not to know this. It may not be possible for A or B to make all his tires alike and good but if they try to and guarantee them, and charge for it, it seems logical and fair to me that they ought to make good to the customer to the point that he pay no more for his tire than if it had not proved faulty. I have thus far used tubes and tires as illustration of the point under consideration but this unfairness extends many times to other parts of autos and to other goods as well.

A friend purchased a speedometer last summer. After a few days' service the distance recording apparatus failed to work. He immediately sent it to the factory with an explanatory note. After a week or two it came back, but it would register no better than before. Three times he paid the expressage to New York and return, nearly four dollars, with no improvement. Then he wrote the company that he was tired of sending it back and should not send it again as he was getting nothing for the outlay. He received a letter saying if he would send it once more they would guarantee either to put it right or give him a new one. He accordingly expressed it again. In a few days he received notice that they had discovered that there was trouble in the driving mechanism and would repair it for five dollars or give him a new one for ten. His reply was, that he had spent all he cared to on the thing and would do neither. That they might keep it. The company expressed surprise and regret that he did not care to accept their "very liberal offer" and the chapter appears to be closed on the subject. "Thus endeth his first lesson."

This bought wit has cost him about thirty dollars. Again I say what is a guarantee worth these days? To me and many of my friends and neighbors I would say, mighty little.

Reply.—Now that our friend has presented one side of the guarantee matter so ably, and withal so entertainingly, it is only fair to state that there is another side to it, although if all were of the same high character and were actuated by the same sense of justice as he is the matter of guarantee might be disposed of with very little trouble.

At the outset, very few purchasers of guaranteed automobiles, or of guaranteed accessories, ever read the guarantee, much less inform themselves just what is intended by such guarantee, or what is expressed or implied by its text.

The intending purchaser is told that the article is guaranteed and he immediately assumes that "if anything goes wrong" all he has to do is to inform the manufacturer, and it will immediately be made good without protest, investigation, or cost. Possibly the dealer does not take sufficient pains to dispossess him of this fallacious idea. If such guarantee were a fact, however, the manufacturer of guaranteed goods would be pretty sure to have his present multiplicity

of guarantee troubles multiplied several fold, and possibly be forced into bankruptcy in the course of a few months.

The question of guarantee gives the average manufacturer more trouble than all his other business perplexities combined. In a recent conversation with a manufacturer of ten years' experience, with a well-known guaranteed automobile staple, he seemed to sympathize with the feeling of the Psalmist, "I said in my haste all men are liars." Indeed, he expressed himself to this effect. He seemed to feel that the purchasing public was out to "do him" by every possible trick and subterfuge, although, of course, his mind had become somewhat morbid by an excess of purchasers who wished to make him bear the expense of their own carelessness, or of the upkeep of their car.

Yes, as stated, most of this trouble is due to a misunderstanding as to the meaning and effect of the guarantee. In nine cases out of ten the guarantee merely states that if the article "proves defective in either material or workmanship" it will be replaced, if returned, with transportation charges prepaid.

Now, who is to be the judge as to whether the article is "defective" or not? Not the purchaser, surely, for if so in very many cases the manufacturer would be grossly swindled. A fact of this sort must obviously be decided by the manufacturer himself, and if the purchaser is not disposed to accept such a decision, he has recourse to a court of law.

It must not be forgotten that in many cases an automobile tire or a speedometer may be sold to a dealer, remain in his place of business a year or two, be finally sold to one purchaser and by this purchaser sold to still another. In the course of two, three or four years, as the case may be, the final purchaser makes a claim for a defect, when possibly it may be due to the ravages of time or to his own lack of judicious care in its use. The manufacturer thus naturally refuses to make good. And there you are.

In the case of automobile tires, with proper care, inflation, speed, road and load, it is rare indeed that they will not give a far greater mileage than that for which they are guaranteed. Any other conclusion presupposes a very short-sighted business policy.

We chance to know of several instances where manufacturers have made replacements and have done so willingly, when possibly they might have refused to do so with justice, for the average manufacturer is quite well aware that one of his most valuable business assets is his intention and practice to use his patrons justly and to do exactly as he agrees.

We have thus attempted to give the other side of this guarantee question which is the cause of so much perplexity, and quite as much so to the honest manufacturer, who is the rule and not the exception, as to the honest purchaser. The only difference in the two parties to this contract is that the manufacturer has a good deal to lose by using his customer unjustly, while the purchaser has nothing to lose by using the manufacturer unjustly save the qualms of his own conscience.

That Magneto Trouble.

From Edward F. Darnell, Ohio.—I see in the Trouble Department of the November issue, No. 1010, Kenneth F. Beers, Indiana, is having trouble with his magneto. I have a Cadillac "30" that has a Splitdorf magneto that gave me the same trouble. I could clean the breaker points and it would run for about

10 miles, then it would skip, and finally quit entirely, but as my car is equipped with a double ignition system I would run on the coils. When the magneto would not work the battery side would, and was clear to me that the trouble was not in the coil. I put a new breaker bar and points on but the trouble was still there. I had a number of repair men look at it, but they all advised me to ship it back. After giving it up as no good, and deciding to ship it back, I learned of an expert in Splitdorf magnetos and took it to him. As soon as he looked at it he said, "That is an easy one." All that was the trouble some repair man had taken the gauze brushes out of the breaker box and placed carbon brushes in it. He replaced the gauze brushes, and now I can start my car from the magneto, and it does not miss firing. The carbon brushes will pick the low current until they get glazed on the point. That was the reason I could run after they were cleaned.

You should have gauze brushes in the breaker box and carbon brushes in the distributor.

GOOD SECOND-HAND CARS.

They Will Give the Best of Service for Years If Well Cared For.

From J. C. Logan, Massachusetts.—Having been helped by reading what other have done, I trust I may be the means of helping some one by relating a few of my experiences in fixing up an old car. I have a Model R, 1905, Stevens-Duryea car, which, by the way, is the first touring car of that type sold in this part of the State. It has traveled about 125,000 miles and is still in first-class repair. When the car came into my hands two years ago it was in pretty poor condition, but by making numerous small repairs it is now in good shape for several years longer.

In working on this car, I have come to the conclusion that similar repairs are made necessary on other machines for the same reason that I have to make them, viz.: Lack of lubrication and inattention to minor adjustments. As to the first, oil is always cheaper than repairs, and to the second, a stitch in time saves nine.

My first job was to repair the transmission. The bearings were all in very bad shape, the bronze bushings being badly worn and the shafts scored. To buy new shafts would be quite an expensive item, to say nothing of the labor of changing the gears from the old one to the new, so I turned down the ends in a lathe until they were $\frac{1}{8}$ inch smaller in diameter than originally. I then made tool steel bushings having a wall $\frac{1}{8}$ inch thick. These I hardened in oil and drew the temper until they could be filed with a new file. The bushings, being made of proper size, were now driven on the ends of the shafts, and I had a shaft that was really better than a new one, in that the bearing, being hardened a little, wore much better. The bushing, having a $\frac{1}{8}$ inch wall, was, of course, $\frac{1}{8}$ inch larger in diameter than the original shaft, and this allowed me to use the old bronze bushings by re-boring them, thus saving the expense of new ones. I have just taken the transmission down for inspection, and find that the shafts and bushings are in perfect condition after a year's run. Just here I might say, never use grease for a transmission having bronze bearings. Use any good transmission oil.

The steering gear was pretty loose, so that was

next overhauled. It was necessary to make new bushings for the king-bolts which hold the steering knuckles to the front axle. Had these ever been oiled, I doubt if they would have had to be renewed. The rest of the looseness was cared for simply by tightening loose nuts and screws.

Throughout the whole machine there was hardly a bolt or a nut that was tight, and more than any other thing that has restored the car was the tightening of all loose parts. The engine is a perfect working piece of mechanism, and for some unknown reason was in good order. The valves have been ground only once in two years, and at present are as tight as a new machine.

After all, with reasonable care, does the car really wear out? At a nominal expense from time to time new parts can be bought to replace worn ones, and as long as this can be done the machine will be of service.

Dangers of Water In Oil.

From E. A. Hays, Parsons.—Referring to No. 994, I had this same trouble with a 1911 Ford, and found I had gotten the car in water till it got into the crank case through the oil gauge, or somewhere, and the running of the engine had beaten the oil and water up together and made "an emulsion" that was slicker than "greased lightning." Remedy: Drain off, run for awhile with kerosene (two or three minutes), drain it off then put in the regular oil used.

Suggests an Oil Gauge.

From Dr. Hendershott, Illinois.—Please say to J. J. Drace, M. D., and all owners of Ford cars, if they will get an oil gauge and put it in where the lower pet-cock is, they can see at a glance where the oil level is. The oil ought to stand about midway between the pet-cocks. The gauge will cost \$1 and is worth \$10 of satisfaction.

More Seating Room.

A new seating arrangement for automobile bodies has been patented in this and several foreign countries, which is said to increase the capacity of the car body for seating from 20 to 30 per cent. This is accomplished by building and upholstering the two side seats from 5 to 7 inches ahead of the middle seat, so that the shoulders and hips of the persons occupying the two side seats are forward of and overlap those of the middle seat occupant. By reducing the width of the upholstered backs of the side seats from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches each, and increasing the width of the rear portion of the middle seat accordingly, ample room is provided for the person occupying the middle seat and whose elbows naturally fall back of and fit into the waistlines of the occupants of the two outside seats. This form of construction on a 48 inch width body, equally divided into 3 seats of 16 inches each, actually provides more room and adds the comfort and advantages of "no-shoulder-hip-or-elbow-interference." In the four passenger body the fourth (folding) seat is provided at the forward corner opposite to steering-post.

It is proposed by the patentee to license automobile body makers to make these seats, and further particulars will be sent on request by addressing So-Sha-Bele Seating Arrangement, Los Angeles, Cal.

DELIVERY AUTOMOBILES.

How They are Sold and How Many Big Merchants and Others Use Them.

It may be interesting to note how the modern truck car or commercial car salesman secures the interest and quite likely the complete capitulation of those who have been using horse-drawn vehicles in their retail delivery business:

"Leave a couple of your horse-drawn wagons in the barn today, we'll do the work," is the customary opening, and the salesman saw to it that the merchant kept track of the expense and the results.

Almost always a demonstration of this kind brings forth an order for one car. At the request of the salesman the merchant keeps track of his motor delivery cost. After the car has been in use for a number of months, the salesman calls and had the merchant summarize the result of his experiment.

Each delivery wagon is called on for an average day's work of 45 miles. The cost of supplies is almost invariably from \$6 to \$8 a month. Tires average from 3,000 to 5,000 miles. A gallon of lubricating oil lasts for from 200 to 300 miles, and a gallon of gasoline is good for about 17 miles, the motor being kept running continuously at nearly all stops.

As a general rule each delivery wagon supplants two horse-drawn rigs though in many cases this number is increased to three. The relative expense of the motor wagon is almost exactly half that of the horses, according to the testimony of many merchants.

Aside from the advantage of economy, in which the merchants generally agree, it is interesting to note the various features in which the motor delivery wagon has appealed to the different men. Enlargement of scope was a prominent merit to many. A California laundryman established routes to neighboring towns and doubled his receipts by use of a wagon. A baker likes his car because pies and cakes ride easily, and reach the consumer in good shape. A grocer is delighted at the absence of breakage of bottles and eggs, compared with his horse-drawn delivery days. A butcher is pleased because his car hasn't run away or smashed anything, as his horses did every now and then. A commission man features the speed of his car, which enables him to fill hurry-up orders and get the goods to the point desired in a fraction of the time his horses used to need. A dry-cleaner says his wagon is invaluable for its advertising help.

Many of the first orders develop into "repeats," some of the merchants admitting themselves convinced that their delivery problems have been solved. Even in cases where the purchaser of a car finds that it supplied all of his needs, this car has given a leverage for the sale of others.

Teamsters, who do nothing else but deliver, to whom mileage is money, and whose income depends entirely on their ability to keep their rolling stock in motion, have come to the conviction that for cold weather efficiency the only certain medium is the motor truck. An increasing number of express companies and teamsters are putting on trucks for this reason, and in holiday times those who own power vehicles count on a good profit from the jobs they get when horse-drawn vehicles prove themselves incapable of doing the distances.

A brewer says when the snow is heavy, as for instance in the case of some of the blizzards of last winter, the delivery chief made it a point temporarily to put all the horses out of commission and depend on

the trucks alone to get the product out to customers. This necessitates doubling many of the routes, and adding extra drivers and helpers, but it is found that the plan works far better than to attempt to make the trips with slipping wornout horses.

A great grocer of New York, who goes far out into the suburbs, says that he can negotiate country roads with trucks long after the horse-drawn vehicle has been compelled to concede its helplessness, and adds that there is no interruption of communication with distant suburban customers, save under conditions where no vehicle of any kind could get through.

A dyer who uses seven gasoline trucks to reach his customers says that he got around all last winter without interruption, in spite of many heavy visitations, and that there was not even any marked diminution of speed.

The great express and transfer companies in New York, who have to work on time, because catching trains gives them a large part of their business, find their winter dependence placed on their power vehicles, both gasoline and electric.

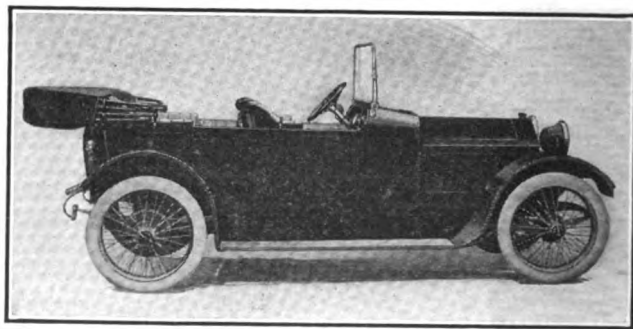
A noted baker, who caters to a large suburban trade, would not think of trying to reach it by horses when the snow lies heavily on the ground. It would not be mercy to the man or to the animal, and in addition, could not possibly prove efficacious.

The merchant who would reap the quickest results from his installation of power wagons will install in time to let them solve all the problems that snow brings, particularly since they afford the only medium that can do this work.

USE WIRE WHEELS.

The Henderson Adopts This Magazine's Oft Repeated Suggestion.

The new Henderson roadster with wire wheels is attracting a good deal of attention. Among the advantages claimed for the wire wheel over the wood



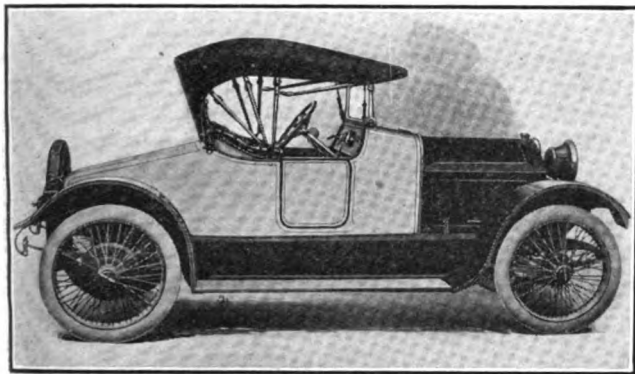
Henderson Wire Wheel Touring Car.

wheel is that it is lighter, and that in consequence it saves gasoline and tires. Besides, it makes the car somewhat livelier, as it increases the ability. There is a saving in the wear of tires due to the reduction of dead or unsprung weight. It is held by engineers that the dead or unsprung weight on the tires is much more destructive than the spring supported weight. Similarly the gain in liveliness is greater than the proportional reduction in the total weight, because the wheels have a dual motion, viz., a rectilinear motion the same as the car, and besides a rotary motion.

Another saving in tire consumption is brought about by the perfect radiation of heat from the steel rim and spokes which are in contact with the tire on

one side and exposed to the air on the other. In the case of the wood wheel, there is no chance for the rim to get rid of its heat since it is backed up by a thick wooden felloe.

The Henderson wire-wheel roadster and touring cars are equipped with McCue wheels of the Q. D. demountable type. The entire wheel is dismounted from the hub, in the event of a tire change being necessary. The wheel is secured to the hub by a floating nut, which forces the hub up on the tapered axle hub. When the wrench is removed from the wheel the hub is automatically locked in position; that is, the wrench cannot be removed until the nut has been screwed up to a certain point, and when the wrench is taken off a spring is allowed to act on two locking pins, which



Henderson Wire Wheel Roadster.

absolutely prevents rotation of the nut until the wrench is again applied.

The extra wheel is carried at the rear of the car on a false hub. This fills the interior of the wheel hub and prevents the accumulation of mud and dust. In addition to being demountable the wheels have a Q. D. ring of the Marsh type, so that tire changes are easily made. This ring is on the inside of the wheel rim, so that it cannot be damaged by a skid into the curb. In case a tire change should be necessary and the extra tire is flat the wheel in question can be removed in a very short time, thus getting it out from under the fender and facilitating the work of changing. An inexperienced person can hardly consume more time than two minutes in getting out the jack and wrench and getting the wheel completely off the car.

ON FROZEN GROUND.

Automobiles Should Receive Especial Attention and Be Handled Carefully.

During the winter, when the ground is frozen the condition of the roads is not as good as in the summer and the car gets more shaking and jerking than in warm weather. This rougher use, which cannot well be prevented, is apt to loosen up and break parts of the mechanism that have not received proper attention during the summer.

When anything does go wrong on a winter tour the driver discovers that making repairs on an open road is quite different from the same job on a warm day, especially with the thought dominant in his mind, that that particular adjustment or repair might easily have been made beforehand in a comfortable garage.

In making his preparations for the winter the owner should go over his car thoroughly, tighten spring clips, adjust brakes, grease and oil all essential parts,

such as rear axle, universals, transmission, clutch and steering gear. Especial attention to the brakes is not amiss and will prevent accidents when the driving becomes hazardous on account of slippery streets.

A realization of the fact that an automobile, properly groomed and given the attention that it deserves, will work all right, no matter what the weather, is probably the reason why the motoring pastime is constantly becoming more popular in winter.

Perhaps the worst of winter troubles comes to owners of water-cooled cars, among which burst radiators, clogged circulating systems and other troubles sometimes appear. In relation to this a Franklin car dealer says:

"If the steering gear works rather hard, the owner should jack up the front axles so that the wheels are free from the floor and soak all connections above the sill with kerosene turning the wheel until it works easily. He should not forget the one at the rear of the diagonal steering tube and the lower end of the steering arm, parts that a large percentage of owners neglect to oil and which, because of constant road splash, become rusty and make hard steering.

"It has been my observation that a large number of automobile owners do not give their cars the attention and care that they deserve or should have, particularly in preparing for the hard winter season. Regular inspection and care are needed in an automobile just as much as grooming and attention of the horse is needed. People are realizing this more and more and that is one reason why automobiling is becoming more popular in winter, owners know that it is not necessary to put their cars up for the winter."

More Advice as to Laying Up a Car.

"The man who puts his car up for the winter wants it to be in good condition and ready to run next spring," says a dealer in Jackson cars "and to have it that way there are certain things that ought to be done.

"For instance, the tires will be worthless, after several months, unless well cared for. Under no circumstances should they be permitted to remain fully inflated. Half the air should be let out, and the four wheels jacked up permanently, so that no weight remains on the tires. If I were going to put my car away, I'd go further than that. I'd take the tires all off, deflate them completely, wash out the cuts, fill the smaller ones with tire gum, have the larger ones vulcanized; then wrap them up in heavy paper and lay them away. They ought to be protected from the light, for light is a cause of deterioration. In many factories, the tire stocks are kept on darkened racks.

"After the tires are cared for, the inside of the rims should be thoroughly cleaned of rust and dirt and coated with shellac to prevent the formation of rust during the winter.

"Of course the water should all be drained from the cooling system and the gasoline from the tank. If the gasoline is to be preserved, it must be put into an airtight receptacle, or evaporation will make it worthless. The oiling system should be drained and the motor transmission and clutch—if the latter is of the disc and oil type—thoroughly flushed and cleaned with kerosene. The old grease should be removed from the axle, grease cups and wheel bearings and these parts thoroughly cleaned. As a finishing touch the exterior of the motor should be cleaned of the season's accumulation of oil and dust. This can be done

by forcing a thin stream of gasoline against the surfaces and taking a brush to the worst places.

"Then raise the top and the car is ready for its winter rest. It's a good idea to put a large paper or muslin cover it, as dealers and manufacturers do, to protect it from dust.

"If the car is to be overhauled, let the repair men do the job now instead of waiting until spring. They'll do better work, because in the spring they will be rushed. The same is true if it is intended to have the paint removed.

FOR GOVERNMENT USE.

The New Parcels Post Law Will Require Thousands of Power Wagons.

The United States Government is a potential customer for many thousands of power wagons by reason of the fact that on Jan. 1, 1913, the Bourne Parcels Post Bill will pass into law. With the Government vitally interested in the road transportation problem, it is expected that more interest will be manifested at Washington in the highway movement.

The Post Office Department handles each year about 13,000,000,000 pieces of mail, of which 185,000,000 are parcels and come under the fourth-class rate. The express companies transport annually 300,000,000 packages, and of these 90,000,000 weigh eleven pounds or less—the limit of the weight of the present fourth-class mail matter is four pounds. Of the two billion or more parcels shipped in various ways by the mail order houses and department stores, full 90 per cent. will fall within the eleven-pound limit of the parcels post law.

With the scope of the postal service enlarged as much as 300 per cent., it will be necessary to handle this tremendous volume of business cheaply and expeditiously, and to do so some transportation medium more economical than the horse and wagon must be found. Not only will motor road transportation displace horse methods, where they are at present used, but the power wagon will find a wide field in branches of the new work for which the horse is wholly unfitted. The result will be the adoption of motor wagons on a mammoth scale, and to a far greater extent than at first glance seems possible.

Undoubtedly a good deal if not the greater part of the Government's delivery work will be done by professional haulage contractors, who, being obliged to bid for the business on a competitive basis, will naturally be forced to make use of the cheapest and most reliable form of transportation available.

This will mean a demand for motor wagons of practically all types. These will be the heavy duty machines for handling large quantities of matter from the railroad stations to the haulage concerns' local distributing station, lighter machines for delivery to sub-stations, high-speed delivery wagons for rural work, and parcel cars for city collections.

In England, where a parcels post service has been in operation since 1883, motor wagons, or motor parcel vans, as they are called, are used in large numbers. For distances up to 120 miles the motor wagon has been found much cheaper than the railroads for the conveyance of parcels under the terms of the Parcels Post Act. British rates are based solely on the weight of the package, without regard to the distance carried—England being a small country compared to the United States. A four-pound package, for example, will be carried thirty miles or 300 miles at the same rate—12 cents. Under the United States' present fourth-class rate the charge for a similar parcel is 16 cents. With the new parcels post rate, the

charge would be 14 cents for any distance up to fifty miles and 22 cents if carried 300 miles.

English conditions are, it is true, different from those in America, especially as regards the length of haul and the nature of the roads. American highways, moreover, are worse than those in England, and the length of haul in intercity service will average much greater. On the other hand, the centres of population in the United States are comparable with those of Great Britain as far as density is concerned, that it is in such sections that the motor truck is particularly adaptable.

Correct Driving Posture.

Concerning the correct sitting position when driving a car, the manager of the Regal Motor Car Company says:

"The tendency among most motor car enthusiasts is toward one or two extremes. They either lean too far forward or allow their body to be tilted too far backward. Each of these positions is incorrect. Neither is a perfectly vertical position the best.

"To have a car under his control at all times the driver should assume a posture slightly inclined backward from the vertical position. If one leans too far forward there is a tendency to strain the eyes in watching the road and the arms become too cramped to handle the steering wheel easily. The extreme backward or lounging position results in a loss of power over the pedals and prevents seeing the ruts and mud holes in the road. When the emergency presents itself the driver is not ready to command the situation.

"With the correct position, complete control of the pedals and steering wheel presents no difficulty. Furthermore the driver can make long trips into the country without tiring before his return. This is especially true where the seats of the car are tilted to the proper angle. There was a time when it was next to impossible to assume a comfortable position at the wheel of any but the most expensive cars. Now, however, designers are incorporating the correct ideas in seat construction in the more moderate-priced models and the observing buyer, intent on making a conservative investment, can find a car that will insure thorough comfort on the road."

Worth Thinking About.

Now that the election is over and every one wishes—or should wish—the utmost success for the new administration and prosperity for the whole country, we cannot be accused of political bias if we print the following from the manager of the Cadillac Motor Car Company:

"The American Protective tariff system is of vital importance to every American factory, workshop and industrial plant.

"To illustrate: Take our business in the manufacture of automobiles. If we were assured that free trade is to prevail in this country we could close out our business here and transfer it to Belgium, Hungary, China, Japan or some other country where wages are at the present time from 10 to 50 per cent. of what they are here and where the material used is also much cheaper than in this country. We could then, after paying freight, put these same automobiles down in New York for perhaps 50 to 60 per cent. of the cost to make them in this country, and the competitor in the United States who continued to manufacture a car to compete with us in price and quality would have but one course left open to him, and that would be to close his place and go out of business. What we could do with automobiles could be done with

the manufacture of boots, shoes, sewing machines, guns, machine tools, locomotives and nearly everything we manufacture in the United States.

"It is so forceful and convincing to any thoughtful person when he reasons it out that if we buy an automobile, for instance, in Belgium, then we have the automobile, and they have the money, and when the automobile is worn out we have no auto, and Belgium still has the money, and if we buy an automobile that is made in this country then we have the auto, the same as before, and we also have the money, and when the auto is worn out the money is here to buy another one. The enormous advantage to the American workman and business man is obvious."

The magnitude and quick growth of the automobile business in this country is the marvel of the civilized world. It is likewise the envy of foreign manufacturers who all acknowledge it would have never secured a foothold here without protective duties. Under the circumstances, the words of the head of one of the oldest and most enterprising firms in the automobile manufacturing business are worth consideration.

STARTING TROUBLES.

Some of the More Common Causes That Arise In All Kinds of Weather.

From Gas Power.—There are many things to consider in the proper care of the gas engine. Operators who have seen nothing but trouble in attempting to run an engine are no doubt largely responsible for it. They have undertaken to run the engine by following the few instructions given them by the expert who first started it for them or by what the salesman who sold it to them had said was necessary to succeed with it.

A man will never succeed who does not try to know what there is to know about running and care of an engine.

We will never forget an incident in our gas engine experience that brings to mind the careless unconcerned operator. It was some years ago, when gas engines were comparatively new and before automobiles were in evidence at all. Our people had sold a gas engine to a man who needed its service night and day. Of course this was a severe test for any engine, and especially so for the crudely constructed gas engine of that time, which compared rather unfavorably with the more perfectly designed and constructed engines of today.

The writer was delegated to start the engine and instruct the night and day operators in their work. After spending something over a week with them and getting very satisfactory service out of the engine, we concluded that we had given them about all the information necessary to run and care for it. Consequently we left them, but a message that the engine was down and they could not get it going again almost beat me back to the factory. We went back to their assistance forthwith and found that both the night and day men had almost turned themselves inside-out at the fly wheels trying to make the engine go, with the battery current cut out. They had forgotten all about the switch lever. We had frequently told them both of the importance of throwing on the current by closing the switch before turning the wheels, and why the engine would not run without it, and explained to them what the office of the battery is and how the current is carried through the wires and coil. And when I went all over this again,

I noticed a sort of far-away, bewildered expression in their faces. They hadn't comprehended that a battery current was necessary for ignition purposes. They seemed to regard it as too mysterious to comprehend.

Why don't the gas engine start? A practical engineer can not always locate the cause at once, but he at least has in his mind practically all the reasons why the engine will not start, and in 90 per cent. of the instances he can locate and correct the trouble in a very few minutes. Everyone should strive to so understand all the parts to his engine that he can readily know the function and see the true method of action in each part. Until he has thus familiarized himself he will not be able to ferret out the cause of existing troubles with any degree of certainty. We will try to give a few of the most common causes that prevent the engine from starting promptly.

Fuel supply tank empty.

Valves and piston rings leaking compression.

Battery switch open.

Weak and exhausted battery.

Loose wire connection.

Short circuit in wire or insulated plug.

Firing pins or contact points loose or fail to make proper contact.

The exhaust pipe may be clogged by burnt carbon, causing back pressure.

The contact points or spark plug terminal may be coated over and dirty.

The mixture may be too rich or too lean. In cold weather the gasoline will not vaporize readily enough until the cylinder or some inlet port has been warmed up by means of a torch.

As a rule starting trouble can be found under one of these heads—Take for instance leaky valves or piston rings, and there is no compression, because the charge taken in leaks out under the compression stroke and there is not enough of it left for the spark to take effect on. Consequently any leak that allows the escape of the otherwise compressed mixture should be stopped. We could not give space enough in this article to tell how to proceed in correcting all the starting troubles above mentioned. But a leaky valve may be due to corrosion or burnt carbon crusts on the seat, which can be overcome by grinding the valve thoroughly with emery dust and oil. Or, the valve seat may be cracked or warped, causing the leak; in which event a new part is likely to be needed. If the valve stem, sleeve or guide are badly worn, a new stem and guide may be necessary, etc.

As a rule, when the cause of the trouble is known, the remedy at once suggests itself. As for instance, if one should find the gasoline tank empty, he would at once proceed to replenish the supply. If he suspects the mixture too rich, he should be familiar enough with his carburetor to regulate the mixture, etc.

The success of the gasoline engine depends largely on the operator and the interest he takes in the various working parts of its construction. It is a simply constructed machine that is not too difficult for the ordinary mind to comprehend, provided the proper application is made in the effort to understand.

In ascending a hill, the lever should be gradually retarded as the car slows down, to avoid "knocking" and loss of power, but may generally be advanced again if a lower gear is engaged as the motor will then run faster.

Automobile Dealer and Repairer

A Magazine of condensed and compact information for busy readers.

PUBLISHED THE MIDDLE OF EACH MONTH BY

THE MOTOR VEHICLE PUBLISHING CO.

71-73 Murray Street, New York

Telephone, 6765 Barclay

Post Office Box, 654

Entered as second-class matter at the Post Office in New York City.

M. T. RICHARDSON, President and Treasurer.

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TERMS OF SUBSCRIPTION.

One Copy, One Year, Including Postage.....\$1.00
One Copy, Six Months.....60 cents
Single Number.....10 cents
Foreign Subscriptions.....\$1.50, or 6s. 8d.

Remittances should be made by Express Money Order, Draft, Post Office Order, or Registered Letter. Foreign remittances, where possible, by International Money Order.

ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, DECEMBER, 1912.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

NO ACCOUNTING FOR IT.

As a nation we are beyond understanding. There is a strong disposition in certain quarters to "twist the lion's tail" and to poke fun at our German cousins whenever opportunity offers, and yet we have a strong penchant for British and German goods. It is undoubtedly considered a mark of distinction to use goods that are "imported."

Not so in either England or Germany. There the loyal subject takes pride in using home products, and he would acknowledge with reluctance that he used or purchased anything imported—least of all from the United States.

There exists in this country an undoubted feeling in favor of a reduction of the tariff and of the consequent privilege of purchasing foreign goods at a less price than they now sell for in this country. Contrary to the feeling in Germany and England, the tendency in this country is to set a high value on foreign products and to consider it "classy" to use them. Yet any one who is familiar with European products as found on that continent, is aware that while it is true they have substantial things there, more "shodily" made goods are found in their markets than in this country, but much of such stuff is calculated to tempt the American tourist or to ship abroad. Yet see how they oppose American made products: In the case of automobiles, an American tourist says after a trip through Germany:

"American-made automobiles are to be discredited at any cost in Germany if the manufacturers of that country have their way. Newspapers are devoting both news and editorial columns to articles calling attention to the 'Yankee peril,' and makers are devoting almost as much energy toward keeping out the foreign products as they are to the development of their own cars.

"Germany is as fully determined to oust the Ameri-

can car as is England, but the opposition there is even more virulent than in the British Isles.

"The Germans have not yet learned the lesson that several American manufacturers have known for some time that quantity production will allow of the highest quality at lowest cost. They cannot conceive of a single automobile factory turning out 40,000 cars in a season. This can be more easily understood when German statistics are seen. There are 128 automobile plants in the fatherland, with a capacity for this year of only about 30,000 cars."

The point is that the German subject seems to be loyal and patriotic even to the extent of suffering individual loss when it will be an advantage to the public welfare, while in this country there is more or less of a feeling to not only look solely to direct individual welfare even though it be contrary to the public weal, but in some cases to even take a pride in the use of foreign goods, whether they be better at the price or not than the home product.

There is no accounting for taste or for the quality of patriotism.

WHAT SMOOTH HIGHWAYS WOULD DO.

As showing the peculiar notions held by many who should know much better, a reader of the New York Times says that to stick to the use of pneumatic tires is "ill-advised." He goes on after this manner: "A pneumatic tire is nothing but an air-filled rubber ball, and no matter how hard it may be inflated, if the pump is strong enough the heavy car is shot up into the air, the much lighter passenger in it being often bounced a foot higher even than the car, with results frequently much worse than the case in question. A spring wheel having the necessary resilience in the springs, with solid rubber tires, is the only solution of this problem."

We have repeatedly shown why nothing can ever exactly take the place of the pneumatic tire. There may be substitutes that will answer its purpose, but of the hundreds of spring wheel patents nothing has thus far solved the problem of weight, durability, and of resiliency right at the periphery of the wheel, where it exists in the case of the pneumatic tire.

The best substitutes for pneumatic tires are the various cushion tires now on the market. But nothing will ever displace pneumatic tires save smooth highways—as smooth, say, as the steel tracks that railway trains run upon. When we get road surfaces of this sort, not only may pneumatic tires be discarded, but automobiles may be made of about one-half their present weight and strength they will last twice as long as now, it will cost but about one-half as much to run them, and there will be about five times as many in use.

THE BUSINESS OF STEALING AUTOMOBILES.

A recent issue of the New York Evening World contained the following: "So many automobiles are being stolen in this city almost daily that the insurance companies are sustaining heavy losses and are on the verge of attempting some combined action that will afford them mutual protection."

As there are several practical devices on the market for locking automobiles and thus insuring their safety, it is singular that car owners do not use them and thus prevent their cars being stolen on city streets or anywhere else. None of these devices are expensive and they are easily attached. They are a positive protection. They prevent the use of the car when in the

garage without the knowledge of the owner. They are less trouble to use than is the operation of hitching a horse.

It is far easier to steal an unprotected automobile than it is to steal a horse and carriage for obvious reasons, the license number being about the only easy means of identification, and even this does not usually answer the purpose, as is demonstrated by the large number of successful thefts.

Physicians are especially liable to automobile thefts owing to their frequent calls upon patients. They run the risk of having their cars stolen every time they leave them unguarded. There are fully a dozen different kinds of automobile locks, most of which lock the steering gear or gear lever. Every car owner should have one, whether he has occasion to use it much or little.

An automobile thief is about the most contemptible of that ilk. He often steals just for the sake of stealing—to get a “joy ride” perhaps, and then leave the car by the roadside disabled or perhaps destroyed—but seldom steals because of his complete destitution or as the hungry thief steals.

With the ease of existing protection victims of automobile thefts deserve little sympathy.

THE KICKER.

Hats off to the “kicker.” He is one of the more useful members of society. But let us not forget the distinction between the “kicker” and the “knocker,” and lest some reader may not be familiar with the meaning of these expressive yet somewhat slangy terms, let it be understood that the kicker is properly a fault-finder, while a knocker corresponds to the biblical term, “backbiter.”

The kicker is approved by the scriptural injunction “Go tell him his fault between thee and him alone,” but the backbiter is strongly condemned. Be a kicker but don't be a backbiter. The kicker makes for progress; his influence is constructive; he is a rectifier, a corrector; his face is always turned toward the sunlight of perfection and progress.

As individuals and as a class we do not kick enough. The straphanging in our street cars, the reckless automobile driving, the little public nuisances that meet us at every turn, especially in city or town, are all due to our neglect of the right and duty to kick.

There is a current and probably correct feeling that the American people are the most patient and long-suffering of any civilized nation on earth when it comes to tolerating things that might be remedied by a strong kick, a long kick, and a kick altogether. Public opinion in England will not stand for an instant what we in this country meekly bear without a protest. To kick is the Englishman's dearest prerogative and the effect of his kicking is the dispelling of much that here exists on every hand to hinder and annoy and block the wheels of progress.

But kicking at private imperfections is possibly more useful than public kicking. “Go tell him his fault” is a wise scriptural injunction.

What can be more beneficial to the car manufacturer than to have a purchaser tell him the faults of his car after having given it a thorough test?

What more useful or suggestive to the hotel or restaurant-keeper than to be told by a patron why his place is inferior and how it may be improved?

What can be more instructive to the editor than to receive an occasional kick from a reader, showing, for instance, how he has done that which he should not do, or failed to do that which he should do

But let the kicking be clear and sparkling, not clouded and sour. Let it be helpful in spirit and not hurtful. Let it have the flavor of good-will and refined and not blunted perception. Thus practised, kicking is a great and vital moving force to correct wrong and to secure increased merit in all channels of service.

AS TO STEAM CARS.

With this number the Steam Car Department of this magazine will be discontinued. Readers who own steam cars and who subscribed for the steam car information, may have the balance of their subscriptions refunded, if they so desire, by forwarding to the publishers, the Motor Vehicle Publishing Company, 71 Murray street, New York, a statement of the amount due them.

The Steam Car Department has always been not only an unprofitable one, but as compared to gasoline cars—small as was the space given to it—the space it occupied was several times the space it merited. What we mean by this is, that the comparative number of gasoline and steam cars in use would fairly give the gasoline cars about one hundred times the space given steam cars.

Moreover, interest in the steam cars is constantly waning. This is owing to the wonderful comparative improvement of the gasoline car following the enterprise of those who manufacture it. Several years ago some four or five steam cars were being produced, while today there is practically but one. To try to get music by constantly playing on one key and that a very unresponsive one, is impossible, no matter how earnest the effort or how high the ideal.

Our hearty thanks are due to those friendly readers who have so generously contributed to the Steam Car Department. Had they not been so loyally helpful it would not have lasted as long as it has. But we relinquish it with no regret. Although it has given steam cars a publicity which was not fully warranted, it was a thankless task, and one which in the case of gasoline cars has always been fully appreciated.

RELATION OF MERIT TO SUCCESS.

It is not pleasant to confess it, but in these days success depends less than ever before upon intrinsic merit. The ability of a lawyer to prepare and ably present a case, the skill of a physician to successfully diagnose and prescribe for disease, the ability of the dentist to do the best sort of work of that profession, the power of the manufacturer to produce a most meritorious automobile—all this is but a single element, and under present conditions and circumstances, an insignificant one to reach the goal of success.

It is true that “nothing succeeds like success”—not even merit. Of course, nothing should succeed like merit, and permanent success cannot be achieved without merit, but the fact remains that many business successes are founded not so much upon merit as upon certain other business qualities that have nothing whatever to do with merit. The dentist must be able to do the best kind of work, but this alone is not enough. He must have the additional talent of knowing how to advertise and how to use his patrons in a way that will bring them back to him repeatedly, even though they may not experience the highest satisfaction with his work. This is the case with every profession or business.

We chance to know that several automobile manufacturers have failed, not so much because their car

was not of the highest merit as because they were lacking in the ability to successfully bring this merit to the attention of the public and to induce them to purchase it.

The time has been when merit, and merit alone, was all that was needed to command success and the time may come again when this condition will exist, but this is not the situation today.

New York Automobile Laws.

At the coming session of the New York legislature the following amendments to the automobile laws will come up for discussion:

Requiring all operators of cars to be licensed.

Providing a flat horsepower registration fee instead of the present graduated tax.

Prohibiting the enactment of local speed ordinances.

Prohibiting the use of manufacturers and dealers' "M-plates" except on demonstrating cars or in removing a car from place to place for the purpose of sale. Manufacturers' plates in duplicate to have separate marks of distinction.

Exempting from tax only cars owned and controlled by State and municipal authorities and used exclusively for official business.

Permitting non-residents registered in other States to operate cars in New York State for an unlimited period.

Legislation to abate the smoke nuisance and unnecessary noise.

Requiring number plates to be kept reasonably clean, and prohibiting the loaning, renting, or changing of number plates from one car to another.

Requiring public garages as well as manufacturers and dealers to keep a record of every automobile which enters or leaves a garage.

Making the operation of a car by an intoxicated person or in a careless or reckless manner a criminal offense, punishable upon conviction by imprisonment.

Giving to the State power to suspend or revoke an operator's permit for cause after a hearing.

Giving State automobile inspectors the power of constables except the service of a process.

Requiring motorcycles to be registered.

It is the belief of the State authorities that in its present form the motor vehicle law, as a licensing measure, does not afford adequate protection to the public, and that in comparison with other States the revenues are not what they should be.

Uses Gasoline and Kerosene.

One car owner at least is using gasoline and kerosene mixed in an ordinary Ford carburetor. He mixes this motor fuel in proportions of one gallon of kerosene to five gallons of gasoline, putting them into the same tank and allowing them to mix. The car which has been using this fuel is a Ford roadster and during the past summer has run more than 3,000 miles. The motor has never been cleaned and yet today it is running as sweetly as the day it was first put on the road. He is satisfied that any motor with a carburetor using hot air for its mixture can run successfully with a fuel consisting of one gallon of kerosene to three gallons of gasoline. Naturally, this effects a considerable saving in the year's fuel bill and will, he claims, eliminate all carbon troubles in your motor, thereby saving many annoying delays and considerable expense.

HE VOUCHES FOR IT.

All Happened Because He Has No Technical Knowledge of Machinery or Automobiles.

From Will P. Lockhart, Texas, in Implement Age.—Anybody can run an automobile!

We frequently hear the above assertion made, and from the vantage point of experience I can vouch for its accuracy. While I have no technical knowledge of machinery, and could not correctly assemble the different mechanical parts of a lawn mower, yet I can run an automobile. I have, so to speak, eaten the pudding of experience, which counts for a great deal more than chewing the string of bald assertion.

It was thus: For the past two years The-Lady-Who-Married-Me has cultivated a rapt, spiritual expression, which continually deepened as one after another, our neighbors invested in rolling stock of the honk, honk variety.

Woman is the mystery of the ages. She will become hysterical and leap from the buggy when the old family Dobbin pricks up his ears and deviates from the beaten way, but no daughter of Eve extant ever refused to climb into an automobile.

But enough of moralizing.

Suffice is to say that I finally hearkened to the seductive spiel of an automobile agent, and later his cipher despatch to the dealer read, "I have met the redneck, and he is yours."

After attending to such trifling preliminaries as turning over all the cash I had, and making a note for the the balance, I climbed into my shining juggernaut and was whisked out of town by the "shuffer," who was to accompany me home, and "learn me to run it."

As we sped along the lanes the driver stamped pedals, flipped levers and slid ratchet bars as he volubly explained to me their uses, but subsequent developments prove that this, my initial lesson, was void of direct results.

True, I learned one thing during this homeward drive. I became thoroughly convinced that a forty-foot lane is too narrow a proposition to accommodate my maiden efforts at the wheel.

Feeling hampered and oppressed by this apparent shrinkage in latitudinal values, I had the "shuffer" drive to the very center of neighbor Jones' 100-acre stubble field before I ventured to take charge of the wheel.

The Scriptural account of Belshazzar's physical collapse, when he was "found wanting," will furnish the reader an idea of my nervous condition, as, under the supervision of the driver, I slowly wriggled the car along, in a manner calculated to turn a blacksnake green with envy. After a while I inadvertently "killed" the engine, and the "shuffer" alighted to crank up.

Runaway Car.

Now, whether I pranced upon the wrong pedal, or whether the driver's carelessness was to blame, or whether there was some defect in the mechanism of the car, will, perhaps, never be known, but certain it is that at the whirl of the crank the car sprang forward with a wild roar and was away, leaving the "shuffer" flat on his back in the stubble.

It was then that I discovered my natural aptitude for motor driving.

Gripping the steering wheel with all the firmness of despair, I inaugurated a series of stunts that would have baffled a pursuing streak of chain lightning.

I am bound to admit that the driver made heroic efforts to board me fore and aft, and I was generous enough to return the compliment by chasing him, at least, half the time.

"Cut off the power!" he yelled to me as I passed and repassed him in graceful spirals.

I endeavored to obey. I stamped every pedal, kicked every lever, batted at ratchet bars and flipped ziz wheels, but all was vain.

My series of circles was continually widening, and with a feeling of horror, I glimpsed the improvements of Jones racing towards me, barn foremost.

Like an ocean craft in the grip of a whirlpool, that fiendish machine continuously circled, and as continuously returned, and nearer ever nearer, to the hay plant of Jones.

At last the snorting demon circled the barn, crashed through fences, and entered the Jones' back yard. Two turkeys and the family dog were here added to the casualty list and the sixteen-foot section of picket fence which had accurately balanced itself across the prow of my machine, demolished a long double row of bee hives, as I again steered for the open sea.

Crashed Into Barn.

Beginning another circle, I again flushed the "shuffer," and to avoid impaling him on my cheval-de-frise of pickets, I steered the car squarely against the side of Jones' barn.

The impact was terrific!

The tenacity with which I hugged the steering wheel probably saved my life. I struck just under the barn eaves and my body, in the form of a ball, rebounded to one side, just as the auto rallied and returned to the attack.

I witnessed the subsequent proceedings from behind a large hackberry tree.

Oh, it was awful!

The uncanny persistency of that blamed machine in eluding the grasp of the dancing "shuffer" and returning to the attack again and again, was almost beyond belief. At last, after it had ripped off most of the planking on that side, it manifested an inclination to tackle the end of the barn, but the "shuffer," taking advantage of its momentary hesitation, boarded from the starboard side and the show was over.

At this juncture Jones arrived on the scene. In his normal state, Jones is a Baptist deacon, but his language on this occasion suggested brimstone rather than final perseverance.

After thorough examining the wrecked machine, an expert ventures the opinion that \$200 will cover the cost of repairs; Jones informs me, through his attorneys, that \$100 for "mental anguish" must be added to the price of his improvements, and the automobile dealer assures me that "it would not have happened" had I obeyed orders. But, as for the driving of an automobile, I can aver, with all the assurance of certain advertisers, that previous experience is not absolutely necessary.

Tire Selling Methods.

From Consul Albert Halstead, England.—Despite the large sales of American automobiles here, American tires have not been introduced into the United Kingdom to the degree that might have been expected, especially as it is stated that there is more actual rubber in the American article than there is in the British or European product, in which, it is said, there is not more than 7 to 10 per cent. of rubber in the outer casing and 35 per cent. in the inner tube, rubber substitutes and fillers being

extensively used. If the trade in tires is to be successfully cultivated by United States manufacturers, heavy expenditure for advertising and other introductory measures will be necessary, but should be preceded by investigations as to the exact requirements of the market. American exporters may not understand how important a part in the introduction of tires and motor parts is played by hill-climbing and other tests and races. Every such success is regarded as the best possible advertisement, and it is quite customary for drivers of automobiles or riders of motor cycles to be in the employ of various firms and to be paid a bonus for each win they make.

If tires are to be introduced by American firms, it will be absolutely necessary for a trained organization to be created in England, and the tactics pursued by British and other makers followed, with such modifications as American sales ingenuity may deem desirable. The thorough introduction of tires by any American company will cost an immense amount of money for advertising, racing expenses, etc., and for many months there would be no return; but if the American tires are as good as they are said to be, and prices right, success, when it comes, will be great, even though delayed by the strong hold of British and foreign tires on this market.

SPARK PLUGS.

Improvements That Have Been Made In the Ignition System.

From Sportsman and Motorist.—In order to procure power from the gas in the cylinders of a gasoline motor, this gas must first be ignited, which produces a chemical change generally termed an explosion, but which is in reality merely an expansion. The expansion of the gas after being ignited pushes the piston ahead of it, thus causing the crank shaft to revolve. In short the beginning of the power impulse of a gasoline motor is the ignition of the gas.

Four methods are employed in igniting the hydrocarbon mixture in engine cylinders; jump spark, wipe spark, make and break spark, and hot tube.

The earlier method employed in igniting the gas was by mechanically inserting and removing a tube heated from outside cylinder by a gasoline flame. Practically all of the early stationary engines and first automobiles had this form of ignition.

As the hot tube system was very inefficient, expensive to operate unwieldy and unreliable, inventors began to make experiments with electric ignition with the result that the wipe spark and make and break spark systems were soon developed. These systems, although little used on automobiles of modern make, are still widely employed on stationary internal combustion engines.

The wipe spark system consists of an arm connected with the positive terminal of an induction coil, and a stud connected with the negative terminal of the coil. The arm is made to revolve synchronously with the engine and to pass across the face of the stud, wiping itself and the stud clean of carbon and oil. Thus the name, wipe spark. As the arm leaves the stud, the gas not being a perfect non-conductor, a spark is produced which serves as the ignition medium. This system has been almost entirely abandoned on automobiles due to the complicated mechanism required to operate it.

The make and break system consists of a cam which strikes a pall, or two points which strike and then recede from each other. In the case of the cam and pall, the cam revolves and strikes the pall, which moves a

short space in the direction of the cam and then flies back to its original position due to a spring action. The spark occurs when the cam leaves the pall. When two points are used, one point remains stationary, while the other is made to move back and forth against it by means of a suitable mechanism.

The mechanisms employed in operating all three of the foregoing spark systems, must be of such a nature that they can be timed to produce a spark at the proper instant for firing the gaseous mixtures in the cylinders.

Before the invention and perfection of magnetos for automobiles, the make and break and wipe spark systems were used on cars where accuracy of timing and reliability of operation were required.

As magnetos became more perfect and reliable in operation, automobile makers who were using these systems entirely or in conjunction with vibrating coils and timers, began to discard them and install magnetos and spark plugs. At the present time nearly all motor cars are operated by magnetos whose secondary current is transmitted to spark plugs in the cylinders of the engine.

Spark plugs have no moving parts, have no mechanical connections, and perform no functions, themselves. They are simply a means of conducting a high tension positive electric current to the hydrocarbon mixture of the motor without permitting this positive current to come into contact with any part of the motor, or other metallic or non-metallic conductor. In other words, a spark plug must be a conductor surrounded by an absolute non-conductor all encased and held together by a conductor.

A satisfactory spark plug must first of all be constructed of such materials that electrolysis will not occur between the conducting and non-conducting parts. The only materials so far discovered for the insulating parts are mica, porcelain and glass. From an electrical standpoint, porcelain is the best non-conductor, mica second, glass third. From a chemical standpoint, porcelain and glass are the best materials for this purpose, as neither of them are attacked by any substances ever used in or about motor cars. From a mechanical standpoint, however, both of these substances are less satisfactory than mica, as they will crack from sudden changes in temperature, and shatter under a light blow from a hammer or wrench. Porcelain and mica are most generally employed for the non-conducting portions of plugs, porcelain predominating at the present time.

One of the principal difficulties of early spark plugs was to procure a metal that would not burn up after short use in the high temperature inside gasoline engine cylinders. Platinum and iridium would, either one, serve this purpose but to make points of these metals would be impossible because of their excessive cost. After several years of experimenting several alloys of steel were developed which were fairly good conductors and which would withstand very high temperatures without burning or melting. These compositions made the present day medium priced plugs possible.

The principal troubles occurring with spark plugs in use are pitting, sooting, cracking, leaking, and short circuiting. Pitting of one of the points is more or less common in all plugs and is caused by particles of the metal being carried by the current from the positive to the negative points. A pitted point should be filed. Sooting is caused by carbon and oil depositing on the points, and can be removed with emery cloth. Cracking of the insulation is due to sudden temperature changes and cannot be repaired. Leaking is caused by looseness or a bad fit.

USE OF SOAP.

The Kind of Soap and How and Where It May Be Applied Without Injury.

A leaflet on The Care of the Car issued by Valentine & Company contains the following interesting suggestions regarding the use of automobile soap:

The automobile has presented many new and puzzling problems to the manufacturer of vehicle varnishes.

The hardest of all to solve, has been that occasioned by the destructive action of automobile soaps, against which no varnish seemed able to stand for any length of time, and under the action of which, the lustre of many varnishes seem literally to "vanish in a night."

"Don't use soap" or "be sure to use a neutral soap," hardly met this problem, for in the first place, the grime, the grease and the road oil collected by the chassis of the car, demanded the cutting action of soap for their complete removal.

And in the second place a truly neutral soap is absolutely without that caustic action which is necessary for cleansing purposes.

Unfortunately the caustic action of the soap does not stop with the oil and grease on the surface of the varnish. It attacks the oils in the varnish itself with the result that the parts of the car where the use of soap is necessary—the hoods, fenders, and particularly the running gear, soon lose all semblance of a varnished surface.

Now the remedy is this; finish the parts of the car where the use of soap is liable to be necessary—the hood, fenders, wheels, etc.—with a soap-resisting varnish.

A word as to the use of soap: The soap itself should never be used on the car. The best method is to make up a strong soap solution, the proper proportion being a pound or two of soap to a gallon of water. Heat the water until the soap is completely dissolved. Enough of this solution can be made up to last a week or two. Then in washing first cleanse the car thoroughly with a hose until all the grit possible has been removed. Add a quart of the strong soap solution to a pail of water, and with a soft sponge carefully wash off the grease or oil. Then rinse thoroughly with clear water and dry with a clean chamois.

Soap should not be used on the body of the car. In the first place it isn't necessary. And in the second place, no varnish has yet been made which possesses the exceptional working and flowing qualities necessary for the largest panels, and at the same time, dries hard enough to resist the destructive action of soap.

Anti-Skid Chain for Trucks.

In relation to an article that appeared in our last issue concerning the matter of an anti-skid device for trucks, the Brockett-Gorham Company of Marion, Ohio, informs us they make an anti-skid chain which has always proved equal to its requirements and that it is having a large sale. The chains can be quickly applied or removed, it is claimed they do not injure the tire, and as far as we can learn, they hold up under the requirements made upon them.

Unless care is taken to clean the surface, some difficulty may be encountered when an attempt is made to paint over any of the polished brass work with which so many cars are adorned. The brass should first be scoured with a mixture of salt and vinegar to remove all grease, after which the surface should be washed with hot soapsuds and wiped dry with a clean rag.

PAINTING POINTERS.

Essential Things in Shop Practice, and Preparation for the Coming Year.

From H. C. Hillick, Pennsylvania.—The automobile painter has many reasons for enjoying the holiday season of 1912. It has been a prosperous season and the coming year promises to be still more prosperous.

In the painting business only, "all things come to him who hustles." The man who ignores publicity is in danger of having to follow in the wake of his competitor. The greatest handicap, all things considering, which the car painter has experienced during the past year has been lack of room. Why not rectify this to some extent, at least? One of the most successful painters known to the writer, recently has located in an abandoned skating rink. Big and roomy, the place has enabled the owner of the business to work on a higher basis of efficiency than commonly prevails. It proves, moreover, that a good many disadvantages can be suffered if the one supreme advantage is to be had, viz.: plenty of good working space. To be sure a skating rink isn't an easy place to heat during the winter, but by the use of partitions and by making everything as snug and tight as possible the question of warming the working quarters can for the most part be handled satisfactorily.

The next thing to plenty of heat is light without which the painter is at the mercy of every dark day.

Naturally, the clean shop is a factor of value in painting and finishing the car. No need to tolerate the dirty shop. It is inexcusable. Use a vacuum cleaner and avoid stirring up a dust. The floor, walls, windows and ceilings, everything, in fact, about the shop can be cleaned by this method. It is the clean and sanitary way. With it, moreover, the interior of the car may be made as "clean as a whistle" in almost a jiffy.

Most likely the shop in the past has not been equipped with the labor saving devices and conveniences necessary to make it as efficient as it should be. Some good jacks and trestles and stout wooden horses should be provided. Even though roughly made, if strong and secure, they will answer the purpose fully. The painter will need, and, in fact, should provide himself with a chest of tools especially adapted to unhooking and hanging off work, assembling parts, etc. Good plain hammer and saw, screw driver, wrenches of various kinds, thread cutters, brace and bits, bolt clippers, etc. This assortment of tools should be kept under lock and key and given proper care. After all, it is not all painting that is done in and about the paint shop. The taking apart, and the assembling of parts, takes up no small amount of time, and the more suitable the tools the greater efficiency established in this work.

Perhaps the bookkeeping method has been at fault in which case the defect should be remedied. A comprehensive, simple bookkeeping system is invaluable in the automobile paint shop. A day book and ledger with a book for the insertion of general data concerning each car handled for painting repairs will suffice.

The importance of this book as a work of reference will soon be established. If no system is in force then one should be inaugurated of furnishing the owner of the car a duplicate of a filed and indexed card containing an itemized account of all furnishings

brought with the car. This saves misunderstandings and often delay in getting the car out.

This is a good time of the year to learn through the catalogues issued by the various color and pigment grinders and manufacturers concerning the latest novelties in this line. The new colors for the New Year have been created and prepared for sale. Color catalogues and price lists are useful in helping a customer to decide upon a color or combination of colors for the car. Often the car owners will choose from the sample colors on the card after having been unable to decide upon any wet color shown him from pigments on the shelf.

It is wise policy to keep posted upon the latest offerings in colors. Manufacturers are constantly introducing color novelties, and while such pigments may be only "fly by night" favorites their popularity while it lasts is sufficient to win widespread recognition among the influential car owners. A study of colors and combinations of color as applied to the various styles and sizes of cars will put the painter in a position to offer expert and accurate advice to customers in search of something to give the car distinction.

Attend the automobile shows of which none surpass the New York shows. At such shows, as no where else, the latest color and ornamental creations may be studied at first hand. Such exhibitions are helpful in suggesting plans and methods for improving the painting and varnishing of cars. They offer advance information along lines of practical interest to the painter. They fit him to speak with authority to the trade "back home."

This holiday season, moreover, is an ideal time to get in touch with local car conditions. Make the acquaintance of car owners. Interest them in the subject of painting the car. Emphasize the importance—the economy, in a word—of keeping the car well protected under generous coats of paint and varnish. Remember, first of all, that it is not all painting to paint.

THE CAR SURFACE.

How to Treat the Body and Top During Cold Weather.

During the cold, moist weather the car should have storage in quarters with sufficient prevailing warmth to dispel moisture. Moisture in any form except that applied through the process of washing is to a greater or less extent injurious to the finish or to the color under the protection of the finish. Moisture is a subtle medium and it penetrates spaces often deemed impervious. When gaining a foothold under the paint its progress is certain and the undoing of the finish is sure.

It may not undermine the paint structure in a day or a night, and possibly not in months, but once seated it works persistently and with the certainty of fate. Garages and repositories are often inadequately heated during the cold months of the year. This is a bad practice, and to the car owner an expensive one. Other things being equal, the varnish will wear longer and maintain its luster more uniformly when given storage quarters uniformly warmed.

The top should at this period of the year receive constant attention, for now are the days of hard usage with days of improper storage. If, when exposed to stormy weather during road service, it is folded up immediately upon its return to storage quarters without drying off and without the necessary cleaning

operations, the top is sure to become very soon the shabbiest looking part of the car.

As a matter of general information for the car owner, it should be stated that all top dressings, renovators and the like should be put on sparingly. A thin, uniform application is more beneficial, invariably, than a heavy volume of material. All cloth linings for the top should get a systematic brushing out, and the leather furnishings likewise require attention. Clean white cotton waste will take up dust and dirt from the leather upholstery. To clean the parts around buttons and tufting an oval chiseled sash tool, such as painters use in washing up work for varnishing, will be found effective. Carpets and other removable furnishings need to be taken out of the car often and put under the vacuum cleaner. Indeed, the vacuum cleaner under the right adjustment can be put inside the car and made to take out every atom of loose dust and dirt.

A car in constant use, and particularly during late summer and autumn, soon becomes unsanitary if left without regular cleaning work for the inside. With all dirt there is mixed more or less decaying matter, and this, to make the car clean and wholesome, should be taken out at the end of every run.

A good practice for removing dust from the outside of the body after a run is to go over the surface with a wool duster. For anything that sticks closer than dust, resort must be had to the water bath, and, in any event, this water bath, as already advised, should be often and generously given. With emphasis it needs repeating that under no circumstances, except those which for the present cannot possibly be surmounted, should mud be permitted to dry upon the finish of the car. When unfortunately, this happens, a soft spray of water will loosen the earthy substance, and then under a gentle volume of water the surface will come forth clean and bright. Always dry the washed surface off with a clean, lint free chamois skin.

Into a 12-quart pailful of tepid water whip enough castile soap to create suds and with a soft sponge clean off the accumulations and freshen up the enamel. This, in fact, is about all the treatment that the hand-buffed or machine-buffed leather top should receive at any time so long as the enamel continues in good condition. Dry off the leather with a chamois skin. If the top is made of rubber, wash with the same weak soap solution, dry off and when the wear of the rubber has progressed sufficiently apply a good reliable dressing, preferably one bought ready for use.

If choice is made of a shop-prepared dressing, the following formula provides for a thoroughly reliable one: Of liquid asphaltum, one part; castor oil, three parts. Stir into the mass a bit of drop black to soften and increase the density of the color. Rub this on the top with a tuft of clean waste. Mohair tops will require a smart going over with a whisk broom. Pantasote may be sponged off and given a rub with some renovating medium to freshen the finish and keep it in presentable condition. Ultimately, of course, it will require something more substantial than a mere renovating, and when this stage of wear is reached, a thin coat of finishing varnish fully elastic, and thinned with turpentine, should be brushed on.

If a spark plug is not operating satisfactorily, it can be tested by removing it from the cylinder without disconnecting the wire terminal and laying the metal part of the plug on the engine. By turning the motor over slowly the electrical circuit will then be completed by the commutator, and if the spark plug is in working condition a spark will jump between its two points.

THE MOTOR TRUCK.

How to Use It Successfully and Give the Best Results.

The truck in its various modifications as sold to the user is now competent to do the kind of work for which it is designed and to give uniformly good results.

In not fewer than 90 per cent. of cases it does so, a fact that can readily be proved. The 10 per cent. of partial or complete failures can in most cases be traced to the operator.

This does not mean that the successful driver needs to be a mechanical wizard. There is no mystery about the motor truck of today. Any man of reasonable intelligence can in a short time attain a complete knowledge of the mechanism of either a gasoline or an electric truck, and become sufficiently skilled to keep it clean, to make minor repairs and adjustments, and, what is more important still, to know what kind of treatment on the road is best calculated to keep the machine going along uninterruptedly at the highest state of efficiency.

This is the problem, to neglect and abuse, or to safeguard and protect.

Many a former driver of pleasure cars has failed as a driver of commercial vehicles because of a love for overspeeding, obtained during the time he was at the wheel of a pleasure machine, and had only to please the whims of some employer of wealth, who cared nothing for expense, provided himself and his friends were carried along at an exhilarating pace when out for a good time.

Such a chauffeur lacks the settled, serious, business-like attitude of mind to succeed as the pilot of a commercial vehicle.

This does not mean that all pleasure car chauffeurs are unfitted to become drivers of motortrucks. Such a generalization could instantly be disproved by the presence of many such drivers in the employ of prominent firms—men who give the best of satisfaction, and who are valued employees, because they have adapted themselves to the new line of work.

The point is that there is no obligation in acquiring the right kind of driver to hire at a high salary an operator who has had a long experience with motor-cars of the pleasure variety.

Many a plodding driver of horse and wagon, whose mechanical knowledge has always been at a minimum, can be converted into the best of drivers, because he is careful, painstaking, conscientious and has never become sufficiently familiar with speed to be reckless with it.

The best instances of the kind that could be afforded are to be found in many of the breweries. These firms are always loyal to the drivers. The man who delivers their product they regard as a link between themselves and their customer, and they are always loth to let a good man go. Some of the foremost officials of such firms feared that their drivers, methodical, slow moving and averse to changes, would have to be dispensed with when motortrucks were installed.

Instead, the Germans, many of them along in years, found the transition easy. They studied the new trucks, asked questions of the drivers sent to demonstrate, experimented with the mechanism, and then went out and drove the vehicles. They didn't attempt to break any speed records; they didn't take the position that because a truck, unlike a horse, doesn't need to be fed and washed, that it can be utterly ignored. They simply shifted their work of care from horse to power vehicle.

What this careful work has meant can be demon-

strated in the long service that has been rendered by the vehicle in the care of local brewers. Using almost exclusively the men who drove their horses, these firms have attained remarkable results, it being nothing uncommon to find trucks now in service for their sixth and seventh year.

One of the largest brewers in Philadelphia, still has in daily use the first truck his firm bought, it being also the first truck ever used for the hauling of beer in Philadelphia.

To nothing else than care, the right co-operation between the machine and the man, can this notable record be ascribed.

To a large extent the employer must set the pace for his men; he must let them know the kind of work he expects.

The man who has no interest whatever in the problems of transportation will not get the same results as the proprietor who gives close attention to methods, who does not regard the deliveries of goods as necessary evils of business, but who, without bothering with the details, nevertheless pays sufficient attention to the problem to know that he has the right system.

Brass Work Made Black.

Many car owners desire to give up the high polish and to have the brass-work finished in black. It is very easy to apply a black finish which will be found satisfactory to the brass parts on the car.

The first method, which gives a rather highly-polished finish in any color desired, is as follows: The surfaces are first carefully polished and then freed from every trace of grease. The lacquer is then applied. The lacquer may be prepared thus: Bleached shellac, 60 grams; Manila copal, freshly powdered, 60 grams; gum mastic, 60 grams; absolute (grain) alcohol, 1 kilogram; coarsely powdered glass, small quantity; allowed to stand (frequently shaking) for 14 days; boracic acid, 1 gram. Filter and use, the best plan being to apply repeated thin coats.

Any desired color may be given to the lacquer by adding aniline dyes. A very little of the dye of the color selected will serve for the purpose. Red and blue will form clear solutions; green must be handled cautiously; it may have to be filtered; yellow is a good dye to handle. In applying lacquers it is desirable to go about it in the same way as shellac is applied—thin coats, deftly applied by means of a suitable brush, with very little rubbing; it will become tacky if it is rubbed very much.

After the brass has been polished and it is desired to lacquer it in order that it may preserve its polish, the first recipe is followed with the exception that no coloring matter is added to the lacquer. This will then be transparent and very efficient in forming a protecting coat over the polish of the brass. It is very desirable to follow this plan with the rims of glass windshields.

Accumulator terminals should always be kept scrupulously free from corrosion, otherwise they will gradually become "eaten away" to such an extent that a slight extra jolt on the road will suffice to break them off, and it may then be a matter of great difficulty to effect even a temporary connection.

The carburetor needle valve must be opened slightly more in winter than in summer to make up for the effect of the cold on the vapor-forming qualities of the gasoline.

LAYING UP THE CAR.

Certain Information Some Car Owners May Find It Profitable to Read.

BY JAMES F. HOBART, M. E.

Don't make the mistake of putting your car away for the winter without giving it a good going over. Take down everything necessary, clean thoroughly. The writer believes in stripping a car and going over each individual piece to note the necessary repairs and renewals. Then repairs can be made at your leisure. They can be ordered and repairs made to the car during the winter months without getting into a rush when time comes to put the car into commission again.

Don't make the mistake of putting the car away with an accumulation of dirt. Look closely to the differential. The writer has seen many a differential taken down and opened, which proved a disgrace to the owner and to the driver of the car. A differential full of mud, is not a pleasing spectacle and the man who realizes what it means to churn metal-filled oil in a differential for week after week will never allow it.

Painting? Of course you are going to paint, and be sure to take off the old paint, don't "cover coat." You can never keep the car looking well if you spread one coat of paint upon another indefinitely. The reason for this is that the behavior of old paint underneath new paint is entirely different from the action of several coats of freshly applied paint. The cracks in the old paint are never filled by the new paint. That is, they will not be filled until the surface is sand-papered after applying the new coat, so as to bring the surface down below the depressions in the new coat caused by the cracks in the old coat of paint. On the other hand if you spread paint thick enough over an old coat to fill the cracks therein, when the new coat dries thoroughly it will settle down perceptibly over the old cracks. That is; the new paint shrinks, and the more thicknesses of paint, the more shrinkage will take place, as there is a greater body of paint in the cracks than elsewhere. The shrinkage of the body of the paint in the cracks will cause the surface to settle down over the cracks as stated. The action is just like pouring metal into a mold. When the metal hardens it shrinks and draws down the metal from the surface. This is the reason why you often see small depressions on the top of a freshly cast metal surface. No matter whether it be brass or iron or lead.

Be sure to take the old paint off. It comes off of wood pretty easy, but removing good paint from iron or steel is a difficult proposition. Scraping will do it. So will sand-papering, but sandpapering off a coat of paint is an awful job which require lots of sand paper and much more elbow grease. The best way to get a coat of paint off of iron work is to chip it off with an air hammer. That is a pneumatic hammer, more strictly speaking. With a tool properly fitted for paint chipping, the drudgery of removing paint from iron or steel surfaces becomes mere pastime.

When you store the top and fitting of your car don't pile them in a heap hap-hazard, but pack them carefully. Straighten out all leather and cloth folds as much as possible, and when two leather surfaces come together it is well to place paper between them, in this way they will never be injured by sticking.

Fittings thrown in a barrel or box, suffer great damage before they can be put in place again. If you don't put the brass work in place immediately, then

clean thoroughly, wrap each piece in paper and store in a dry place free from dust. It is quite a task to keep dust away from a car in storage. The best way is to put the upholstered pieces inside of alpaca covering and tie them up securely.

How about the magneto? Does your car have one? There is nothing like the high tension ignition magneto. You don't have to bother with timer, spark coil, or battery, and there is no vibrator to take care of. If you use a high tension magneto on one trip, you will never be without it.

What are you going to do about that muffler cut-out? It is mighty handy sometimes and there is a very handy form of cut-out advertised whereby you simply cut a notch in the exhaust pipe and clamp the cut-out over it. Somebody should go a little further and add the exhaust whistle to operate in the same manner. There are times, and many of them, when it is mighty handy indeed to have a long distance signal. The exhaust whistle is first-class for this purpose but it should not be used in town for it makes too much noise for street use.

There is a form of exhaust whistle made to be attached to the end of the exhaust pipe and when a signal is needed a pull upon the lever, trips the whistle into position over the end of the pipe. This is a very good arrangement, as the exhaust gases are not continually passing through the whistle to put it out of business. With a whistle attachment as described, the exhaust does not pass through except when a signal is being sounded. If you can arrange to cut a notch in the pipe and operate both the muffler cut-out and the exhaust whistle therefrom then you will have a right smart good arrangement.

Automatic tire pump? Of course. Life is too short to spend it pumping tires by hand. Add one of these tire pumps to your equipments and your tires will always be in better condition.

If you install a lighting magneto, be sure to add a trouble finding lamp to your repair kit. Even if you have no low tension magneto, just throw a few dry cells into a corner of the car and attach the trouble lamp to them in such a manner that by attaching a flexible cord and turning a switch you will have a fine crawling lamp for lighting, mounted in a cute little wire cage on the end of a handle! You can push this attachment into all sorts of corners and it is worth a good many times its cost when dark night hides a bunch of trouble in the chassis.

When you lay up a car be sure and look for lost efficiency. Leaky piston rings are great causes of this loss. Go over the pistons and rings carefully and if there is the least appreciable side movement to any of the rings or if they do not appear to bear nicely all around, then just remove those rings, and have a new set of eccentric rings made. There is nothing like the well mounted eccentric rings. The straight ring is leaky to begin with and it don't get much better in use. Every straight ring yet made, bore on only three points when first put into the cylinder.

Have the rings turned a little too large, then have them split and the ends fitted closely together. Then have the rings turned outside and inside, and then brought to the exact size by turning again on the outside. This looks like a whole lot of work, but you will get a whole lot of pay for it. It is the only way to get a ring which fits entirely around the cylinder circumference, and just as sure as rings don't fit, then just so sure you lose compression and lots of it. You can't afford to have "pretty good compression" in your en-

gine. You have got to have first-class compression, and the best there is, is none too good.

Don't be afraid of having the cylinder dressed out inside and new pistons and rings fitted. If you can find the least signs of scratches on the inside of the cylinders then have them put in the lathe and either ground or reamed to take out the marks. It sure causes loss of compression, and no matter how small the marks may be, air and gas will leak through them between the piston and cylinder wall. Automobile power sneaks out through awful small holes; you can't have too good a fit between cylinder and piston. Also around intake and exhaust valve. You can lose compression at these points just as well as between piston rings and cylinder.

And while about it, how is the carburetor? Is it a modern appliance or is it a has-been which should have been scrapped a couple of years ago? The gasoline we must use today is not like that which could be obtained four or five years ago. The gasoline we get now requires a first-class carburetor to vaporize it. Not only is a good carburetor required, but it will pay to add a primer to the car before you take it out next spring. With a good primer it may be said that many a car becomes almost self-starting. One or two methods have been described in this journal for making and operating priming devices. Some one of them surely can be adopted to your considerable advantage.

Have you looked into the crank case lately? Is it clean, or did it look as though someone had started an ink factory, or as if somebody had been operating a plumbago mine in that part of your car? More than one crank case the writer has seen opened, when it looked like a plumbago pulverizing mill. Sometimes it is well, just before you lay up the car, to draw off the oil from the crank case, fill with kerosene and run the car a few miles with that liquid in the case, but don't make the mistake of using kerosene for crank case lubrication when running the machine on the road. It is a fine habit to use kerosene once in a while in the crank case, but be sure after running it a few hours to carefully draw out all the kerosene and fill the case with a suitable oil. This is very good practice, but run any length of time with kerosene in the case is very poor practice.

Does the clutch suit you as well as you would like? Did you ever investigate the multidisc clutch? Anyway, no matter which you select, or if you rebuild your old clutch, be sure to fit this so that you use a lubricated clutch. Any clutch which must be used dry is not for my automobile, and many others say so too. Every clutch or brake worth considering should be constructed so as to work when thoroughly lubricated, even when running in an oil bath. Many clutches, and a whole lot of brakes will not meet these conditions, but it is one which should always be filled.

Tires and Dampness.

The action of moisture on the rubber in a tire is insignificant, but its effect on the canvas is serious enough to be worthy of attention. Experiments made by the Michelin Tire Company show that if cotton is dried quickly after contact with moisture it suffers little, even if this happens many times. If, however, the fabric is left to lie in a moist atmosphere, on the floor of a damp cellar for instance, spots and stains will soon make their appearance. Destructive growths will rapidly reduce the fabric to mould.

It follows that what really injures the canvas in

pneumatic tires is continued dampness. If water is allowed to get into cuts which extend through the tread to the fabric some such condition of continued dampness will be brought about, for once the moisture enters a cut it has little chance to evaporate.

Tires should therefore be stored in cool places which are perfectly dry. After travelling over wet roads envelopes should always be dried. So likewise after being washed. It is important that tires be washed regularly in order that cuts may be revealed, cleaned and repaired. The best way to wash a tire is to sponge it lightly when fully inflated, using the smallest possible amount of water and drying both tire and rim carefully as soon as the operation is complete.

OVERHEATING.

Some of the Possible Causes That Are Sometimes Overlooked.

A reader says: My car recently displayed a considerable tendency to overheat. The first point suspected was the circulating water pump, but the removal of the radiator cap showed that the water was issuing freely and quite as usual from the outlet pipe from the cylinders. Despite this, and the fact that the car was a comparatively new one, so that there was no likelihood of the water jackets and radiator having furred, and also that the fan was working perfectly, the overheating continued, but strangely enough it was intermittent, and after periods of excessive boiling the engine would run perfectly for ten or a dozen miles.

Happening, however, on another occasion to remove the radiator cap while the engine was running, not with the idea of inspecting the circulation, but in order to ascertain whether more water was required within the radiator, I noticed that no water was issuing from the outlet pipe from the cylinders. The pump coupling was examined, but appeared to be in order, and the pump spindle was rotating. Dismantling the pump, I found that the paddle was loose on the spindle, the taper pin conveying the drive, and for this end passing through both paddle and spindle, having sheared.

The cause of the intermittent character of the overheating, and the reason for the apparently perfect circulation of the water on the occasion of the first inspection, were no doubt due to the paddle partially seizing upon the spindle when the water boiled, owing to the heat generated by the slipping of the paddle on the spindle adding to the heat of the water.

While the pump was dismantled I noticed that a considerable amount of wear had taken place by reason of the paddle rubbing against the casing of the pump, with the result that a certain amount of water short-circuited, as it were, so that the pump was not so efficient as it should have been even when the taper pin was whole and in position. To overcome this defect which probably had something to do with the taper pin shearing, the cover of the pump was put in a lathe and the inside face turned back, and a brass plate made, riveted, and soldered in the recess so formed. To prevent the paddle touching the outer case a washer was necessary to replace the amount of wear which had taken place on the shoulder of the paddle.

It appears to be quite feasible to suggest that a goodly proportion of the complaints regarding the overheating of old cars is due to the wear which has taken place in the casing of the water pump and on the shoulder of the paddle which forms the thrust bearing, thus, as I have already suggested, allowing

the water to short-circuit and rendering the pump very inefficient.

Another reader says concerning the same subject: One simple cause of overheating is frequently missed even by designers. It is well understood, of course, that the air which passes through the radiator enters the bonnet, and in order that this air may have a free passage it is obvious that a free exit from the bonnet must be provided. Many present-day cars are fitted with closely-fitting bonnets and either a closely-fitting undershield or crank chamber webs which extend right to the frame edges. Furthermore, the dashboard is carried low down, with the result that the air entering the bonnet is bottled up, preventing the cooling air from entering through the radiator. In the early days practically every motor car bonnet was formed with open space at the sides. Probably the abandonment of this has been due to the early practice in which a flywheel fan was employed to draw the air out of the bonnet. Other makers copied the plain sided bonnet, but in many cases omitted to provide other means of egress for the air which is drawn through the radiator, usually by means of a fan.

If overheating or boiling occur the interior of the bonnet should be examined to ascertain what chance there is for the air to get out at the back, and it must be understood that the area of the outlet should be as great as the area of the air passages through the radiator. If it be thought that the air inlet is choked the experiment should be made of running the car with the bonnet removed, under the same conditions as when boiling has occurred. If thus providing a free passage for the air remove the trouble, the dashboard should be cut away or some other method devised to provide a clear passage under the footboards; or, alternatively, openings may be provided in the bonnet sides to conduct the air away.

If the car was satisfactory when new, the suggested experiment does not favor a solution of the trouble, there is the possibility that the water-jackets or radiator have become silted up with furry deposit to be considered. The radiator should always be filled up with clean water and, if possible, soft or rain water. Under no circumstances should any soapy water be used, as it coats the surfaces with soap, preventing heat conduction.

If these suggestions do not remove the trouble, and if, as stated, the engine worked properly originally, it is very possible that the silencer has become choked up; to make an experiment to ascertain the correctness or otherwise of this view, one of the exhaust joints on the main exhaust pipe may be disconnected and the car run in this manner.

If abnormal gasoline consumption accompany the excessive temperature it is probable that the trouble is with the carburetor, and this may either be found to be flooding or the jet may not be screwed in tight, causing leakage and excessive gasoline supply. A choked gauze in the carburetor air intake will upset the balance of the mixture, resulting in too much gasoline being supplied to the engine. Insufficient lubrication naturally produces high temperature but on modern cars the lubrication system should be almost above suspicion.

A choked muffler may be the cause of high gasoline consumption as well as overheating, for it is obvious that if the efficiency of the engine be lessened by the want of a free exhaust this inefficiency will also be accompanied by excessive consumption. Therefore, one must not assume that excessive consumption and overheating are necessarily due to carburetor trouble.

SELLING AUTOMOBILES.

Division of Territory—Discounts, Rebates and Volume of Sales.

From Ernest R. Benson, of the Studebaker Company.—Territory in one sense is the capital of the sales manager, inasmuch as out of the territory he has to obtain his results. The subject of territory, therefore, demands continually the deepest study and research. In the division of territory there are many things that must be considered, and one thing of great importance is to find the trend of the market, i. e., where the people buy, where the natural centre may be for the district under consideration, the natural boundaries, if any, in the district—oftentimes districts are hemmed in by rivers or mountains; ascertain carefully the railroad centres, where the jobbing centres have been and are at the present time, where the best distributing point may be, whether the town which is considered a centre has good roads radiating from it or not. It is a recognized fact that a city or town which desires to maintain its standing as a trade centre must have long stretches of good roads, not affected by the weather, diverging from it in every direction.

It is obvious that it would be a very difficult matter for a dealer to maintain himself in one corner of a district while the natural trading point would be in another centre. It would cause the dealer extra expense; trade would get away from him which would go to the dealer who might be located in the genuine trade centre. This is to be watched with extreme care, as it has a great deal to do with the sale of motor cars.

The manufacturer has to consider the dealer with whom he may wish to contract in connection with the territory. The personality of the dealer has a great deal to do with the amount of territory that may be assigned to him, his financial worth, whether he can carry the proper stock for a given district or not, and whether or not the dealer's personality will enable him to get together an organization that will maintain the proper standing and gather in a sufficient amount of trade from the district that he may desire to contract for, and whether or not he may have sufficient energy and courage to keep at work at all seasons.

So that in summing up the first few conditions we have to consider the trend of the market, being sure to find the natural centre; give consideration to railroad centres, jobbing centres and distributing points, and then to the personality and ability of the dealer to organize properly.

Further than this, we go into the population of the territory. Naturally a dealer in a sparsely settled district would be given more territory than a dealer located in a very thickly populated city or county. Again, the characteristics of the populace must be studied and consideration given to the wealth of the people, whether there are people there who can buy motor cars in goodly quantities or not, whether the people are wage earners in mills or retired capitalists, as in some few cities of the country, or whether the territory be filled with live, hustling business men having good incomes and classed as good buyers of motor cars. Naturally a dealer's territory which contained people with good incomes and who are good prospects for motor cars would be smaller in area than the one who would be located in a sparsely settled agricultural district.

Again, we must consider whether the territory under consideration has good roads or not. This has a decided effect upon the purchase of motor cars. Districts in which good roads have been built will under equal conditions take many times more cars than where the roads are bad. So that in addition to the other summary we have to consider in the division of the territory the population, the wealth and the roads of the district.

The systematic watching and guarding of territory and careful gathering of information as to the amount of business done in each district is now a necessity in the motor car business, and many concerns have most ingenious and thorough methods for accomplishing these results, and with some companies the superintendent of territory has a most important position. One of the hardest problems in connection with the territory is finding ways and means to keep the dealer energetically, wisely and thoroughly working the district assigned to him. This in some ways is a greater problem than the division of the territory itself, and is a point which is to be watched with the greatest care.

In considering the boundaries of a dealer's district it is very important that attention be paid to the liability of one dealer infringing upon the rights of another. This oftentimes becomes a very serious matter and should receive most careful consideration in the making of contracts with dealers.

The discounts are naturally separated into several classes: First, that given to the large distributor, who acts more or less as a jobber and controls a large territory, having many dealers under his jurisdiction, and whose territory might further be split up by sub-dealers. Second, the man termed the dealer, who does not have such a large territory but who sells more directly to the consumer and has possibly a few sub-dealers in the limited territory which he may control. Third, the discount given to the sub-dealer, who has a very small territory, possibly a township, or perhaps a town only.

The old method of giving the distributor a large discount and allowing him to divide it up as he pleased did not always secure the best results to the manufacturer or to the dealer, so that now it is quite generally accepted that the discounts and territory should be controlled by the manufacturer.

In this problem we also have to consider handling dealers through branch houses. It costs something to support branch houses and generally large districts are assigned to branches in which to do a wholesale and retail business. As a result the dealers procure their cars and supplies from branches and are not in every case obliged to carry the stocks they otherwise would. Therefore, this naturally has some influence upon the discounts which are granted by branch houses to dealers and sub-dealers. Again, in considering discounts to dealers it is necessary to take into account the amount of stock which the dealer is able to carry (this would apply both to cars and to parts) and the season of the year when he may accept his deliveries. We are always looking for the ideal dealer, who will take a specified number of cars each month the year around and pay cash for them and in addition will always keep on hand a good stock of parts so that service will be given to his patrons in an ideal way. These dealers are increasing in number as they are becoming cognizant of the fact everywhere that this is the best way to conduct the motor car business.

The bonus, or rebate plan, giving an extra discount for a certain volume of business or numbers of cars

bought and paid for, has been used considerably in the past. This has worked well in many cases and is being used to some extent quite satisfactorily. The dealer, however, is beginning to have some serious objections to this plan. The dealer states that his rebate is generally tied up until the end of the season and that sometimes this is a considerable sum; that he gets no interest on this money, and that he has no use of it for a long period. Then the manufacturer states from his side that this rebate is not a part of the regular discount, but that it is a genuine reward for the accomplishment of a large amount of business and that the money has not been earned until the total amount of business has been attained.

This plan many times causes overbuying by the dealer at the end of the season as he will frequently arrive within a short time of the close of the season and have quite a number of cars to purchase in order to obtain the desired amount of business. This in some instances has caused the dealer to take on a stock of cars that is sometimes difficult to dispose of, and in some cases induces price cutting, which is not a good thing for the dealer or the manufacturer. This rebate plan, from the manufacturer's standpoint, is one of the best means of persuading the dealer to work and sell the number of cars for which he has contracted and generally results in binding the dealer close to the manufacturer.

Another plan, which is greatly increasing in use because of the many merits that it contains, is the system of graduated discounts, the contract specifying that the discount to the dealer commences at one rate and increases 1 per cent. at each step up to a certain amount, at which the maximum discount will be granted. This plan has a great many good features. The dealer is constantly making more profit and is continually striving to get the maximum discount. It causes the dealer to work in a very encouraging way, and there is no question of a rebate at the end of the year. The dealer is making the most money when he is doing the most business.

This plan also binds the manufacturer and dealer closely together as the dealer naturally will not want to make a sacrifice after having started on the way with the manufacturer. By this plan a small dealer is not treated unjustly. He gets the same amount of discount for a given amount of business as is given to a large dealer, and if the small dealer can in any way increase his business he is sure that his ratio of discount will be increased according. The large dealer of course obtains a larger discount for the maximum amount of business. The system is growing rapidly in use and seems to be mutually satisfactory to dealer and manufacturer.

Many methods of preventing the hardening of spare tire tubes have been exploited, but one of the simplest methods is to place them in hot water once every month or six weeks. This is said by motorists who have tried it, to keep the rubber in excellent condition.

The speed of the car should never be reduced by retarding the spark, as that causes waste of fuel and heating of motor; instead of doing something to make the fuel less efficient it is better to reduce the amount used.

The motorist should give special care to seeing that the mud guard beneath the engine and gearing is kept free of volatile oil for the reason that at any time a little gasoline might get in with it and start a fire.

MOTOR NOISES.

What Causes Most of Them and How They May Be Remedied.

BY JAMES F. HOBART, M. E.

Ever since automobiles have been built, the best engineers in the world have been diligently searching for ways and means whereby engine noises can be decreased. To the credit of these engineers, it can be said that some automobile engines run almost noiselessly. Manufacturers are constantly improving the output in this respect and in a few years more the automobile will be practically noiseless.

Some of the motors in use today are decidedly noisy, but considerable of this noise is useless and might be obviated by the automobile driver. Upon looking into the several causes of engine noises, it is found that several of the causes are under control of the mechanic, while several causes cannot be so controlled. There also exists a third list of noise making causes which can be controlled to a considerable extent by a little study and forethought.

To properly consider the different kinds of engine noises, let us divide them into four groups:

- 1.—Loose adjustable connections.
- 2.—Poor fittings in rings, cylinders, frame, etc.
- 3.—Resonance—the vibration of parts composed of various metals.
- 4.—Passage of air vapor through pipes, valves, etc.

Loose connecting rods, which is a common cause of noise in engines. Many gasoline engines are not fitted with means for taking up lost motion between the piston and connecting rods, but depend entirely upon compression to keep down the noise. In cases of this kind, no compression, or poor compression, permits a very undesirable knocking in a cylinder. Such piston construction is not at all desirable and should be avoided by the automobile purchaser.

The remedy for loose crank bearings, shaft, journals, loose babbitt or bronzes, is directly under the control of the mechanic. He has merely to keep the bearings tight, see that babbitt and bronzes are fixed firmly in place, replaced when necessary and he will have no noise whatever from this cause.

Loose Cylinders.—This class contains a cause of noise which is seldom found, but which exists to a certain extent and often leads to a merry dance before the cause of the trouble is located. Really this is a vibration of the cylinders, either between themselves or against the bed, through not having the bolts properly tightened, or from the cylinders being put in place with loose dirt between themselves, or between them and the bed. This subsequent packing of the dirt allows the joints to loosen slightly and gives the cylinders a very slight motion between themselves, or them and the bed. Only the mechanic who has been up against these noise troubles knows of the difficulty in locating them.

About the only way it can be discovered, save by going systematically over the bolts and making them all tight, is to strip the engine as much as possible so it will be fully visible when running. Then squirt some oil along the joint between the cylinders and between the cylinder and the bed. Watch closely the oil as it flows along the joint and if there be the least lost motion or movement between the parts, the oil film will break and fill along the joint in a manner very apparent, provided it is seen before the oil film is dissipated. The remedy for this difficulty is obvi-

ous. It means cleaning out the joints between the castings and making them up properly.

Poor Fittings.—This group contains three classes, two of which are ring troubles. The third, a very unusual noise making cause, is due to piston trouble.

When piston rings are too narrow, either from wear or from being made that way, there is great loss of compression, also a very undesirable clicking noise in the cylinder, which is very hard to locate. It is possible to have loose rings without much loss of compression for the reason that one of the rings may carry the compression and do all the work while the other ring or rings may cause the clicking sound, which mechanics often fail to locate.

The only way to find this trouble is to dismantle the engine and examine the rings closely to see if there is lost motion between each ring and its seat in the piston. A sort of rough and ready test for locating ring trouble, may be tried out and will work sometimes, and other times it fails. The method in question is to pour some thick heavy oil into the cylinder, crank the engine by hand until the oil has worked into the rings, then start the engine by its own power and listen for clicking. If it be due to a loose ring as above described the clicking will not be heard until the thick oil has worked out of the ring cavities. Therefore, if the clicking commences a few minutes after this test has been started, it is quite certain that the trouble is due to narrow or loose rings, but as stated, sometimes this test fails for the reason that the rings click nearly as bad with oil as without it.

Sometimes a ring of carbon will form inside of a cylinder, or the wear of the piston against the cylinder will develop a ridge of cast iron against which the piston strikes, making a solid thump. Sometimes one of the rings strikes this ridge and forms a clicking noise. This cause may usually be discovered, for the reason that it does not commence until a few minutes after the engine has been started.

While the engine is cold or nearly so, the ring or piston does not quite reach the ridge but as the engine becomes heated and thus expands then the iron is driven into contact and the clicking commences. The cure for this trouble is, of course, to remove the cause. If it be carbon, the car driver can do the job, but in case of a worn cylinder it must go to the shop.

Unbalanced Pistons.—This cause of cylinder noise is quite rare, at least it is supposed to be of infrequent occurrence, but no one knows how many pistons are noisy in this way. This is a structural defect and its cure is beyond the power of the automobile user.

Fig. 1 described the manner in which this source of noise gets in its work. It will be noticed that the center line of the connecting rod K is slightly to one side of the center of the cylinder. The movement of the connecting rod is indicated by the lines F and G. The piston is shown crowded crosswise of the cylinder, touching at C and D with a cavity at A and B. This is during the upward stroke of the piston, with the rod in position as shown at F. During the compression stroke, the rod will lie along the line G and the position of the piston will be reversed. It will touch the cylinder at A and B as shown, but not at C and D. This to and fro movement causes a distinct clicking sound which may be hunted for weeks before it is located.

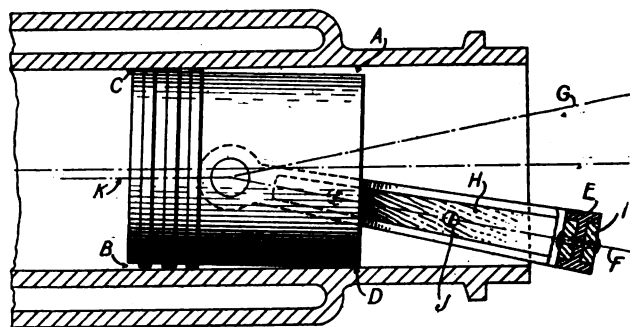
The remedy, of course, is a new piston. Sometimes pistons are loose in this manner and do not make a noise. This is because they are cushioned, more or less, by the action of the rings.

Resonance is a cause of noise which is very little

understood outside the experimental rooms in large automobile manufactories. A good idea of the noise caused by resonance may be obtained when listening to a locomotive passing around a curve. The squealing of the wheels as they slip over the rails is one form or type of noise in this class, but it is not the kind which gives automobile trouble. Listen closely to the locomotive and you will hear the side rods vibrate in a very peculiar manner, and in a very noisy manner as well.

It has been found that the ringing of these rods depends a good deal upon the kind of steel from which they were made. The writer is of the opinion that considerable of the very peculiar noises which occur in some automobiles are due to resonance of the engine parts, more particularly to the connecting rods.

A friend of the writer who has a splendid six-cylinder car of his own design and construction, has



Clicking Pistons.

decided to his own satisfaction that the connecting rods are noisy. These rods are made of manganese steel. He is about to try the experiment of putting in new rods to see if the noise will be lessened. Meanwhile he is trying the experiment shown at A and I, Fig. 1. Holes have been drilled through the rods which are of H shape, and pieces of hard wood have been fitted closely into the webs of the rods as shown, and riveted tightly together. He has found that this does reduce a certain noise made by the engine, and he is now about to replace the manganese steel rods with plain 40-point carbon steel, and see what effect the change will have on the engine noises.

Probably there is not as much sound caused by vibration of piston as by the rods and other cast moving portions of the engine. But undoubtedly considerable noise may be charged up to this "vibration theory," and the writer will be greatly interested to hear from any correspondent who has obtained data in this direction.

As is undoubtedly the case that different metals vibrate in different cycles, and when the metal vibrations coincide in the time of their greatest amplitude, they sometimes give a musical note. Any kind of noise reproduced sufficiently often, will give a musical tone and when it occurs oftener than thirty times per second the tone is distinguishable by the human ear. When the vibration occurs three or four hundred times per second, it gives a musical tone somewhere near the middle of the piano. Investigation of this class of noise-making will prove interesting and will undoubtedly lessen some of the obscure noises which now give trouble or discomfort to the autoist.

Air and vapor of gasoline cannot be driven through pipes or openings without causing more or less noise. This source of trouble offers a prolific field for investigation on the part of the automobile expert. When air or vapor acquires a certain velocity in a

pipe or through an opening, noise is sure to result, and any increase in velocity due to an obstacle in a pipe will also cause noise. A familiar example of this type of noise is heard every time a faucet or valve is partly opened, and a fluid flows through under pressure. The local reduction of passage-area at the valve, causes a greatly increased velocity and this causes the hissing noise always heard when a valve is partly open.

Air, entering the carburetor, gasoline being sucked up with the air, and the vapor passing into the engine cylinders, all make more or less noise; and it is up to the designer to study this matter and so arrange openings and pipes that the noises will be as slight as possible. Even the ignition of the charge is not a noiseless operation and more noise is developed as the products of combustion pass out of the engine.

Taking care of the exhaust, offers a whole lot of problems in the noise reducing line, and I must say to the credit of some makers of automobiles that very, very, little noise is heard from their machines, by the exhaust. Wish I could say that of all automobiles, but I can't.

There are innumerable small noises incident to the operation of an automobile, and bear in mind, that the very slightest of these noises is not too slight to be worthy of earnest study for the purpose of its elimination. If it be found that the passage of air through the water radiator, causes a faint rushing sound, then let the designer by all means, work out a construction for the radiator which will permit the air to pass through it in a manner completely noiseless. If it is found that the gears hum, when in use, let the designer investigate the angle of obliquity of those gears, and see if a different angle will not give gears more nearly noiseless.

See that the trimmings and the furnishing of the car are so arranged that they do not chafe, rattle, or otherwise cause needless noise. There is bound to be too much noise in any automobile, but things are much more to our liking if all the needless noises are eliminated. And the greater number of noises which now pester the soul of the autoist, will yield to persistent, determined effort of all concerned, as outlined above.

Let us then, instead of devoting all our energy to cutting a second off the speed record, cut a little noise off the map!

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Automobile accidents increase greatly, as is usual, as the cold weather comes on and the streets and highways become slippery with rain or ice. In fact, a large proportion of the accidents reported this month are due to skidding. It is well known that there is one way to avoid skidding and another way to avoid serious consequences from it. Good tire chains will prevent skidding and slow driving will prevent serious consequences from skidding when anti-skid devices are not used. The accidents reported below have each a lesson to drivers, but quite likely hundreds of others might have been reported that were equally useful.

Four Victims in Three Days.—The Minneapolis newspapers report an unusual number of serious accidents recently, and quite likely this is because of the

cold weather in that locality which causes an unusual amount of skidding. In one case, the driver of an automobile gave a heavy cart a side-swipe, so to speak, and both were pretty well demolished. In another case, a man had his skull fractured at about the same time, owing to a skidding car and in still another instance, a man was struck by an unidentified automobilist and almost instantly killed.

Racing With a Train.—In Philadelphia three girls and two men were injured when the automobile in which they were riding attempted to go faster than the railroad train. They struck a hole in the pavement and were thrown against a telegraph pole. One may die. Four others are very seriously injured. The automobile was registering fifty miles an hour when the crash came. The party had all been to the theater and were having a fine joy ride until the accident happened.

Had Her Throat Cut.—In Baltimore, Maryland, as the result of being thrown from the seat of an automobile into the wind shield, a young woman was taken to the hospital suffering with a severe cut on her throat. There were others in the car, but they were not seriously hurt. It appears that the driver of the car turned around to spread a lap robe over one of the young women who was sitting in the rear of the machine. He kept one hand on the steering wheel, but in turning around he gave a sudden twist to it, and the machine crashed into a large tree.

The Car Turns Turtle.—Near Zanesville, Ohio, an automobile containing three men skidded from the road and plunged over a 300-foot embankment. It appears that the road ran beside the railroad track and for a distance the automobile led the railway train. The driver said he would like to keep up with the train but felt it would be rather difficult to do so. However, the machine was made to do about all it was able, but soon a rough road was encountered and then a tire suddenly burst throwing the machine one side when it skidded and turned over the embankment as stated. One of the occupants was killed and the others very seriously injured.

Victims of Crossing the Street.—In Paterson, N. J., a woman was struck and fatally injured by an automobile while attempting to cross the street. She was knocked down by the car which stopped so quickly that she remained between the front and rear wheels. The occupants picked her up and hurried her to the hospital where she soon died. A charge of manslaughter was preferred against the driver. Not long afterwards a boy who was playing in front of his home ran in front of the car and was almost instantly killed by being run over.

Result of Rapid Driving.—Near Newark, N. J., a car going at a rate of speed variously estimated at from 40 to 60 miles an hour and containing six passengers, suddenly over-turned and all were badly injured. Great secrecy was attempted as to the cause of the accident and the names of the parties, but it is known that the car was being madly driven and swerved and skidded.

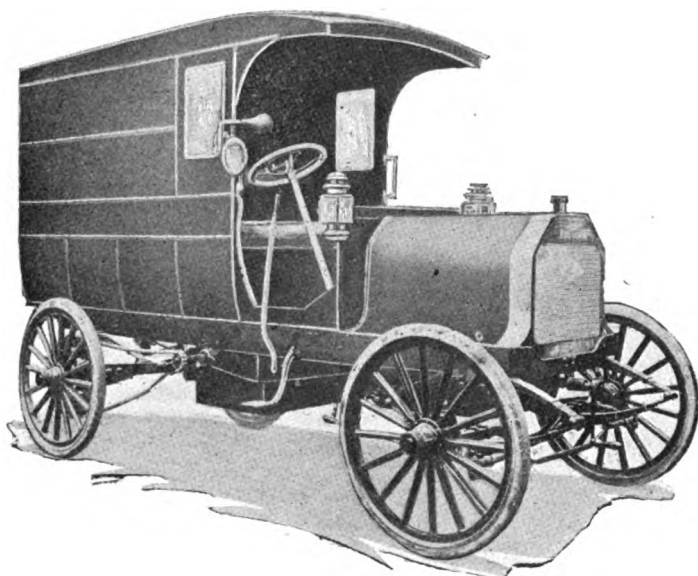
Both Legs Broken.—In Baltimore, Md., Thanksgiving Day, a man had both of his legs broken and was generally bruised about his body in an attempt to jump from the car when he saw it skidding into a telegraph pole. The rest of the party remained in the car and were uninjured although thrown out. The car was pretty well demolished.

One Killed and One Hurt.—During a midnight ride near Los Angeles, Cal., two men were driving in a

light car when it skidded into a tree and both were caught beneath the wreckage when it turned over. One was almost instantly killed and the other will bear the marks of the accident a long time.

No Gear, No Clutch, No Valve.

The Kearns Motor Car Company of Beavertown, Pa., have been going slow in their business, but there has been a constant enlargement of their output year by year, as well as a steady improvement in construction. It is well known that the car is a unique one,



Kearns Delivery Car.

being gearless, clutchless and valveless. This car was not placed upon the market until the firm had satisfied itself that it was practical and efficient, and improvements have constantly been made until now its distinctive features have fully realized the faith of the firm which devised them. The illustration shown herewith is that of their commercial vehicle which ought to be extremely popular for delivery purposes of the retail trade in cities and towns. The price is extremely low for a car of such substantial construction, and those interested would do well to address the firm for further information as stated above.

Distillate as Fuel.

In our last issue, a writer from California gave an account of the use of what he termed "distillate" as fuel for his car and stated that it was satisfactory and much cheaper than gasoline. Several readers have written to learn what kind of "distillate" was used. Most of them naturally had the idea that it must have been denatured alcohol or some form of an alcoholic product. The "distillate" referred to is of more common use in the West than here in the East. It is a distillate from benzine, as we understand it, and the price of it is far less than that of gasoline. It is about 40 degrees gravity and the flash point is from 130 to 140 degrees. The cold test is near zero. There are now something like 150 trucks in the far West which are equipped for using this distillate instead of gasoline as a fuel. A small tank is carried on the dashboard which is filled with gasoline for starting purposes. When the motor is warmed up the distillate is turned on and it is stated that no difference can be detected in the operation of the engine.

SOME INGENIOUS DEVICES.

For Power Transmission for Carburetor Control, and for Other Betterments.

The wire mechanism made by a London, England, firm, is well known in connection with the transmission of power in other than a straight line, and reference will not be made here to the earlier applications of this particular principle, it being simply necessary to mention that the mechanism consists mainly of two parts a closely coiled and practically incompressible spiral wire, constituting the outer member, and a wire cable practically inextensible threaded through the above and forming the inner member. Previous to the use of this the usual method of transmitting power around bends was by means of angle levers and rods, cables and pulleys, which involved complication. The simplicity of application of the wire control has, therefore, led to its adoption in many ways, some of which are of special interest to engineers. Leaving out of the question in this article such uses as handle bar control for brakes, and clutches, and the application of the same principle to foot levers, attention may be directed to its use with carburetor adjustments.

Fig. 1 shows the control used for the extra air inlet on the carburetor of a $2\frac{1}{4}$ h.p. two-cylinder light weight English car. It comprises an air shutter and a special cap for the end of the throttle, together with a stop plate, stop, spring and the necessary wire mechanism and lever. An interesting method of regulating the air inlet by hand is shown in Fig. 2. In the illustration A is the outer member of the wire mechanism, B being the cap, while C is an adjustable stop, which butts against D, the lock nut for the stop. E is the body of the inlet, having air holes, and the valve seating for the valve F. G is a spring controlling movement of the valve. H is the inner member of the wire mechanism, while K is the block to which this

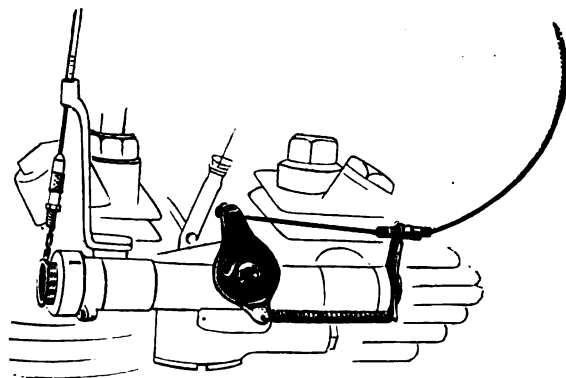


Fig. 1.

inner member is attached. L is a base of the inlet which can be, of course, made to fit any diameter of pipe. M being a screw stem, supplied with a shaped washer N, and a lock nut O. One side of the inlet pipe is drilled according to the base of the inlet body and a similar hole is drilled on the other side of the pipe. The stem M is passed through the larger, and out through the smaller hole, being made tight by means of the washer and nut. The amount of air admitted to the inlet pipe is governed by the suction of the engine on the valve F which is normally held on to its seat by the spring G. The tension on this spring may be varied from the steering column or other convenient place by a mill headed screw, one complete turn of which moved the block K only one-

twentieth of an inch, this giving an extremely fine adjustment.

A very interesting equipment is an auxiliary air inlet shown in Fig. 3. A great number of cars are not up to full efficiency owing to a bad regulation of air, but by means of this apparatus an additional air supply may be introduced in very fine gradations, the adjustment being controlled through a length of the wire mechanism. The control lever can be placed at the point nearest the driver, or the mixture may be regulated while driving. This enables the varying conditions of road, temperature, etc., to be provided for as they are encountered, and thus a maximum efficiency is obtained while actually effecting an economy in the gasoline consumption. Moreover, means are afforded of thoroughly scavenging the

carburetor agitator, which does away with the necessity of lifting the engine bonnet in order to flood the carburetor preparatory to starting. This old system of tickling the carburetor was always an objectionable and grimy one, and Fig. 4 shows how simply the operation can be performed by the use of the means described. The push button A has on its body a milled edge flange bored with three holes in order to give a means of attachment to the button of a plate or bridge piece. The outer member of the wire

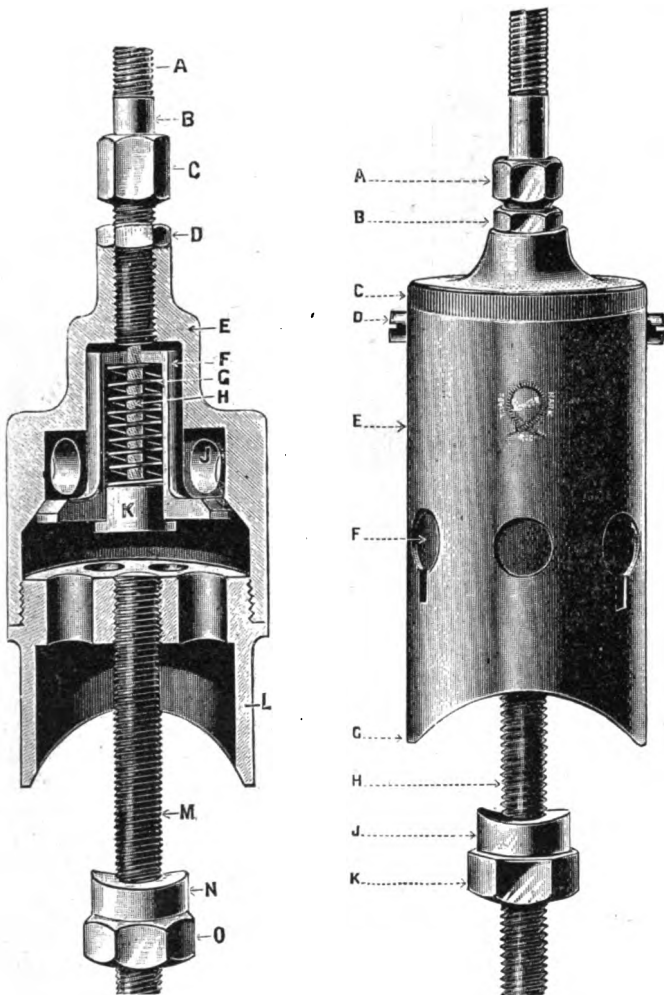


Fig. 2

Fig. 3.

cylinders with cold air when descending hills by fully opening the inlet. The device will work in any position and it can, therefore, be placed in the most suitable point on the inlet pipe somewhere between the carburetor and the inlet valve, or in the case of multi-cylinder cars, between the carburetor and the branching of the inlet pipe. The body E is of cylindrical form pierced with a number of air holes F, and curved on the base G to fit the shape of the inlet pipe. Inside the body is a plunger which is normally so placed as to completely close the holes F. When more air is required the plunger is drawn upwards by means of the wire mechanism, gradually uncovering the holes and allowing additional air to be drawn in.

Another useful device, made by the same London firm, in connection with motor car equipment, is a

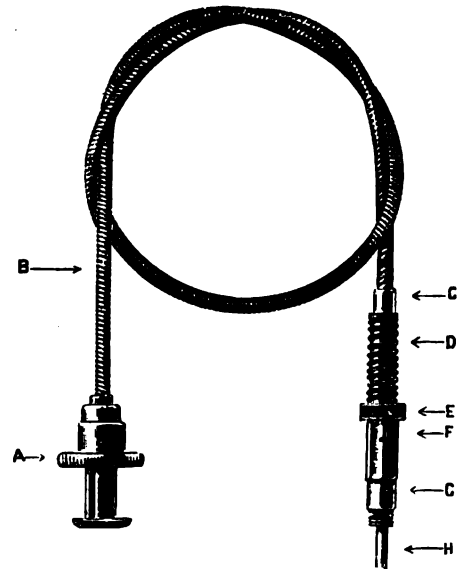


Fig. 4.

mechanism terminates in deeply bored stops at A and C and a substantial spring D ensures the proper return after operation of the plunger piece H. The inner member of the mechanism is fastened at the push button end to a block screwed into A and at the plunger end to a block F which is held in position by milled edge nuts E. The body G is screwed for attachment to the carburetor top and the plunger is kept out of contact with the float when it is not in use. As a rule the push button is fixed to the radiator, although it

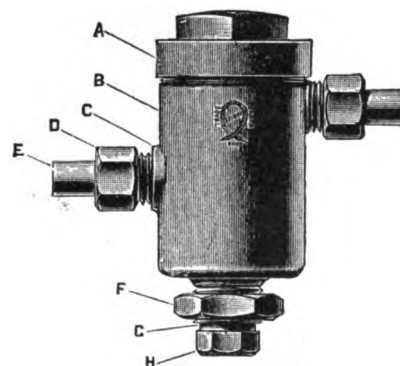


Fig. 5.

can be fixed elsewhere, if preferred, and all that is required when about to start is to press this button, there being no necessity to lift the body.

Another device in connection with the gasoline supply is a special form of gasoline strainer and this is exceedingly useful as the presence of solid matter in the fuel when it reaches the carburetor is one of the most fruitful sources of trouble on the road. It is found that no matter how carefully the fuel is strained when the tanks are being filled, solid matter finds its

way into the tank and flows with the fuel into the carburetor with the result that the jet is choked and the car is brought to a standstill. Hence it is necessary to strain the fuel afresh immediately before it reaches the carburetor, and this is accomplished by the appliance shown in Fig. 5. The spirit enters at the lower union E, flowing upwards to the carburetor through the top union, any solid matter being arrested on the under-side of the straining gauzes, and consequently falling to the well at the bottom of the body H. This well is so shaped as to ensure every particle of dirt being run off when the plug H is taken out. Provision is made at the base of the body of the strainer for attaching it firmly to a bracket or to the channel steel frame of the car. The screwed cap A is made with a squared projection on the top to allow easy manipulation and as it is lined with a soft lead washer, it makes a perfectly air-tight joint. The gauzes are held between three washers which, in their turn, are firmly fixed on a wire handle by two nipples.

Two other important devices may be mentioned in conclusion. One of these is a new gas throttle shown in Fig. 6. The most noticeable defect apparent with the ordinary butterfly pattern throttle is the difficulty of grading the gas supply with that nicety which is essential to satisfactory and economical working. The lever has first to be moved considerably before any reduction of the gas is apparent, and then a very slight further movement shuts off the gas completely. With the present mechanism, however, in place of the butterfly valve the piston is so placed at right angles to the inlet pipe, that it can be drawn across by very

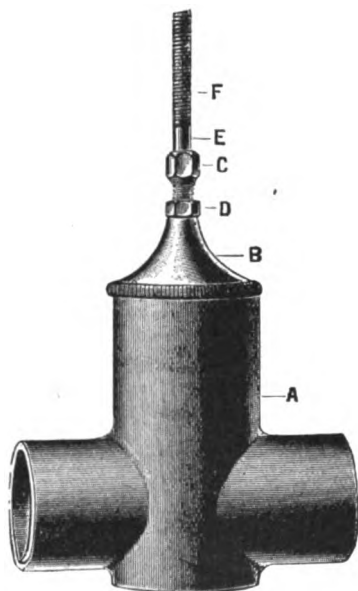


Fig. 6.

small gradations until the gas supply is cut off entirely. Provision is, however, made against entirely cutting off the gas by fixing an adjusting stop which just allows a sufficient quantity of gas to pass when desired to keep the engine running slowly. The method of attaching this device is to cut the inlet pipe, removing about one inch of its length and to solder the throttle into position, thus making the pipe gas-tight and of the same length as before. It will be seen that the throttle can work equally well in any position.

The other device is exceedingly ingenious and is an exhaust cut-out which when used rationally is a

most useful attachment to any car. Looked at from one point of view the exhaust cutout provides a reserve of power which is found very useful when, for example, an unusually steep hill has to be mounted, or when it is desired to increase the power of the engine to secure fast traveling. Over and above this, however, it provides a very useful means of testing the engine while traveling as the missing of a cylinder is immediately observed as soon as the cutout is open. Yet again, it is valuable as a means of signalling the approach of a car when there is the possibility of the ordinary warning not being heard. It is, however,

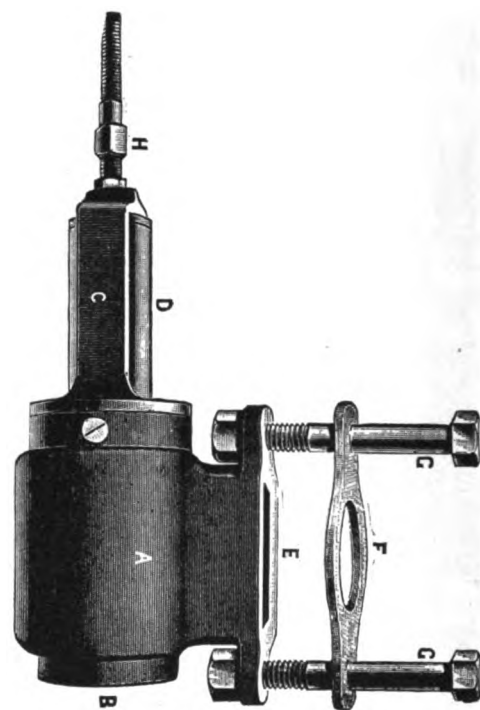


Fig. 7.

important that such an attachment should be perfectly gas-tight when it is not in operation, as otherwise the quiet running of the car is spoiled to the discomfort of the occupants and others in the neighborhood. This noise is a common fault with some cutouts even when they are not in use, and in order to ensure perfect gas-tightness, the service illustrated in Fig. 7 is fitted with a valve on a ground seat, on a similar principle to the exhaust valve of a gasoline engine. The body A has an aperture at E for the entrance of the gas and a circular outlet at B. This outlet is usually closed by a mushroom headed valve, the stem of which projects into the extension C and this extension is protected by a light tube D. A strong spring encircles the valve stem and holds the valve firmly on its seat. The end of the extension piece C is made to take an adjustable stop as previously described in connection with the Bowden wire mechanism, the inner member passing through the stop and being fastened to the valve stem. The opposite end of the wire mechanism terminates in the usual lever on the steering pillar, dash board or foot board.

This resumé of the mechanisms adopted for motor car control by the London firm referred to is interesting inasmuch as it illustrates the flexibility and ease of mechanical adjustment which is effected by the use of the principle as described. The system very materially adds to the certainty and accuracy of control and is, therefore, of real interest to all who wish

to obtain as much efficiency and economy as possible out of the car under their control.

Cleaning the Car.

"Motorists are fighting grime and grease with a vengeance," says a Hudson car representative. "And it seems that the innocent cause of it all is the humble garage man, the grease-covered, good-natured individual whose life is a ceaseless chain of gasoline, oil and the underneath of cars. But there is a solution to the problem. You can keep clean in an automobile, if you won't make it necessary for the grease-covered one to enter the car. Some of the high-priced cars, such as the Packard and Pierce Arrow, have made it unnecessary for the garage man to enter the car by placing gasoline tanks upon the rear of the car. The rear gasoline tank, too, is a feature of the new Hudson '37'—adding cleanliness to the beauty of the big new car. The tank being a large one holding 22 gallons does not need filling often."

"One trip into my car by a gasoline dispenser, who was covered with some peculiarly determined grease," said a motorist, "cost me \$45 for a complete new suit of clothes. The man just leaned his elbow on the seat of the car when emptying the gasoline can into the tank, and his hand rested upon the back of the seat. He got my coat and trousers at the same time."

Every owner should each morning wipe the dirt, grime and whatever grease has collected from the backs and cushions of the car into which a garage man has crawled. If the owner possesses the affluence necessary to the employment of a chauffeur, that should be the latter's duty.

By taking care of the car each morning with a cloth just moist enough to take up the grime and grease, and by not allowing garage-men to get into the car, the "keeping clean" side of the motoring question is taken care of. There are other good mechanical reasons for the rear gasoline tank. The gasoline flow from the tank to the carburetor which feeds the engine is due to air pressure. The air pressure system means an even flow at all times. Going up hill or down the flow is the same. You have seen cars backing up steep hills, because if they went up, engine foremost, the gasoline would not reach the carburetor—the force of gravity would pull the gasoline back into the tank.

Use For an Old Car.

Dr. A. C. Stewart of Denver, Colo., who is a very enthusiastic motorist, having owned cars practically since the beginning of the industry, claims to have solved the problem of what to do with the old car. His solution is to drive it.

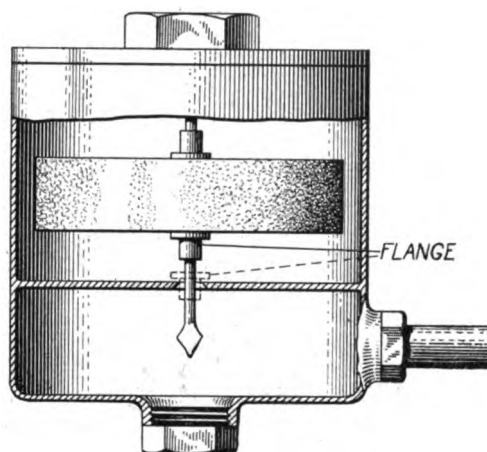
In speaking of it he said: "I have frequently been asked by owners of cars how I have managed to keep my car running so consistently and so well for such a number of years, and I have always answered the question by stating that my success was due to two reasons. In the first place, when I purchased a car I purchased one which I knew was properly constructed. The second reason is that I have never tinkered with it."

"During the last four years I have driven my car between 85,000 and 90,000 miles, which I think is a very fair record for a 20-horse power car, driven by the owner. On the present trip, during the last month, I have covered about 2700 miles and I expect that before I reach San Diego, which is the ultimate point of

my tour, that counting side trips and detours it will cover at least 4000 miles more, which will bring my mileage pretty close to the 95,000 mark."

Carburetor Trouble.

From William Cook, Ohio.—I notice in your last issue, L. C. A. Co., Wisconsin, No. 1022, asking about his trouble with his four-cylinder Maxwell car. As I have had just the same experience with my father's car I herewith enclose a rough sketch of what I found to be the trouble. Of course this may not apply to this car but it is likely. I have always made it a rule never to trouble the carburetor on my car or any car until I found that the trouble is there. After going



over the car in question I found that the wiring was perfect, engine tight, and then went after the carburetor. The Maxwell cars have a carburetor with a cork float, and this float was fastened to the valve stem of carburetor by a small flange both at top and bottom of float, and soldered to the stem. I found that the bottom flange came loose and dropped down and this nearly closed the opening for gasoline, and the more you fed the gas to the motor the lower this float would go and the smaller the gasoline opening would be.

THE LOWEST PRICE YET.

Something Novel But Substantial and Very Cheap to Run.

It is something unprecedented to learn of an automobile with a capacity for a load of 500 pounds that is sold to dealers for \$292.50. The manufacturers say "In all the world there is no car like this," and they are probably right. Judging by the endorsements received, however, it meets any requirement in reason that has been put on it, and of course it is so much cheaper than the horse and horse-drawn vehicle that there is no comparison between them. The following specifications of the Handy Wagon, Jr., will be read with interest:

Motor.—Double cylinder, four-cycle, opposed type, air-cooled, $3\frac{3}{4}$ bore x $3\frac{3}{4}$ stroke, capable of developing 11.2 h.p. Exhaust valves mechanically operated. Intake valves automatic. All bearings made of white bronze, extra large and long. Oiling is by force through a sight feed lubricator, using the compression from the crank case to force the oil. Very simple timer.

Transmission.—Planetary type; two speeds. for-

ward and one reverse. All bearings made of bronze. Gears cut from steel, and perfectly fitted, bushed with bronze and run in oil bath. The slow and reverse speeds are worked by foot pedals and the high speed clutch (fibre faced) is operated by hand lever. All gears are locked when on high gear.

Frame.—Constructed of $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{4}$ -inch angle iron. To take a body 30 inches wide by 72 inches long. The frame work is suspended from the springs by hangers. Two angle iron cross bars form the motor support. The transmission is attached to the engine by a flange on the end of the transmission shaft, bolted to the hub of the fly wheel. The outer end of this transmission shaft is supported by hangers with bronze bushings.

Counter Shaft.—The counter shaft is one-inch cold rolled steel. The differential, which is of the bevel gear type, is placed near the center of same. The sprocket on the transmission shaft is connected with

Equipment.—Two oil side lights, 1 oil tail light, horn.

Repair Kit.—Wrench, screw driver, oil gun.

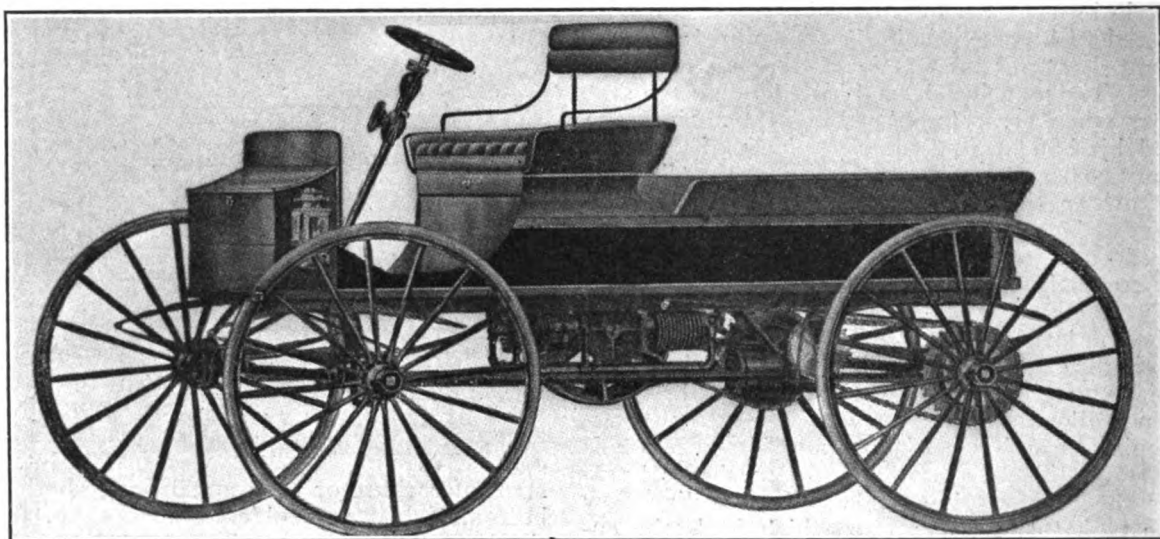
Capacity.—500 pounds.

This car is made by the Auburn Motor Chassis Company, Auburn, Ind.

Lubricating Oil.

The use of the right oil for the lubrication of the motor is vital, and the car user must to a certain extent rely upon the fidelity and honesty of the manufacturer of that lubricant. If the product used is not suited to the purpose, the damage done being of a gradual character, cannot be observed from day to day, as can the wear and tear on the tires of the car. The viscosity, which, in other words, means the fluidity of the oil is also a factor in its affording proper lubrication.

Where the motor is worn and there is an appreciable



Price to Dealers, \$292.50.

the sprocket on the differential by $\frac{1}{2} \times 15$ -16-inch pitch chain. The counter shaft is supported by hangers, one on each side of the differential under each iron frame. The chain is tightened between transmission and differential by sliding counter shaft back. Slots are cut in angle iron frame to allow take up.

Muffler.—Very silent and no back pressure.

Steering Device.—Bevel gear type.

Carburetor.—Float feed type, especially designed for our motors.

Ignition.—Jump spark, coil, dry batteries.

Brake.—Contracting type, one on each sprocket of rear wheels.

Springs.—Elliptic, $1\frac{1}{2}$ inches wide, 36 inches long, 5 leaf, 8 inches, opening front and rear.

Axles.— $1\frac{1}{8}$ inches. Long Distance, Collinge collar, front and rear.

Wheels.—Sarven, No. 7 flange, $1\frac{1}{4}$ inch rim, 34 inches, front and rear.

Solid $1\frac{1}{4}$ inch rubber tire.

Reaches.—Wood, straight, strong, ironed with 1-inch channel; stay braces front and rear.

Wheel Base.—65 inches.

Body.—31 inches wide x 32 inches long, back of driver seat.

Seat.—Large with lazy back and cushion.

Painting.—Body black; carmine gear.

play either in the bearings or between the piston and the cylinder walls the purest oil that can be obtained and of a heavier grade is required. When the motor is new and the bearing and wearing parts fits snugly and properly, a lighter oil should be used.

The system of lubrication used is also a factor which should help determine not only the character, but the quantity, of the oil used.

The exhaust smoke of motor cars can not be entirely overcome by making use of a particular kind of oil. Intelligence and care are required in order that the proper volume of oil may be used either in the crank case or injected into and against the working parts at proper intervals. Carbon deposits in the cylinders and in the piston heads can be reduced to a negligible quantity, provided the foregoing suggestions are followed.

The service rendered by the motor is so vital and the expense involved in its overhaul and upkeep so great, that it behooves the user and owner to insist upon getting the right oil for his type of car.

An Acceptable Christmas Present.

A great many of our readers will want to bestow some little present upon friends that would be of practical value and at the same time not too expensive. We suggest a subscription to The Automobile Dealer and Repairer for the year.

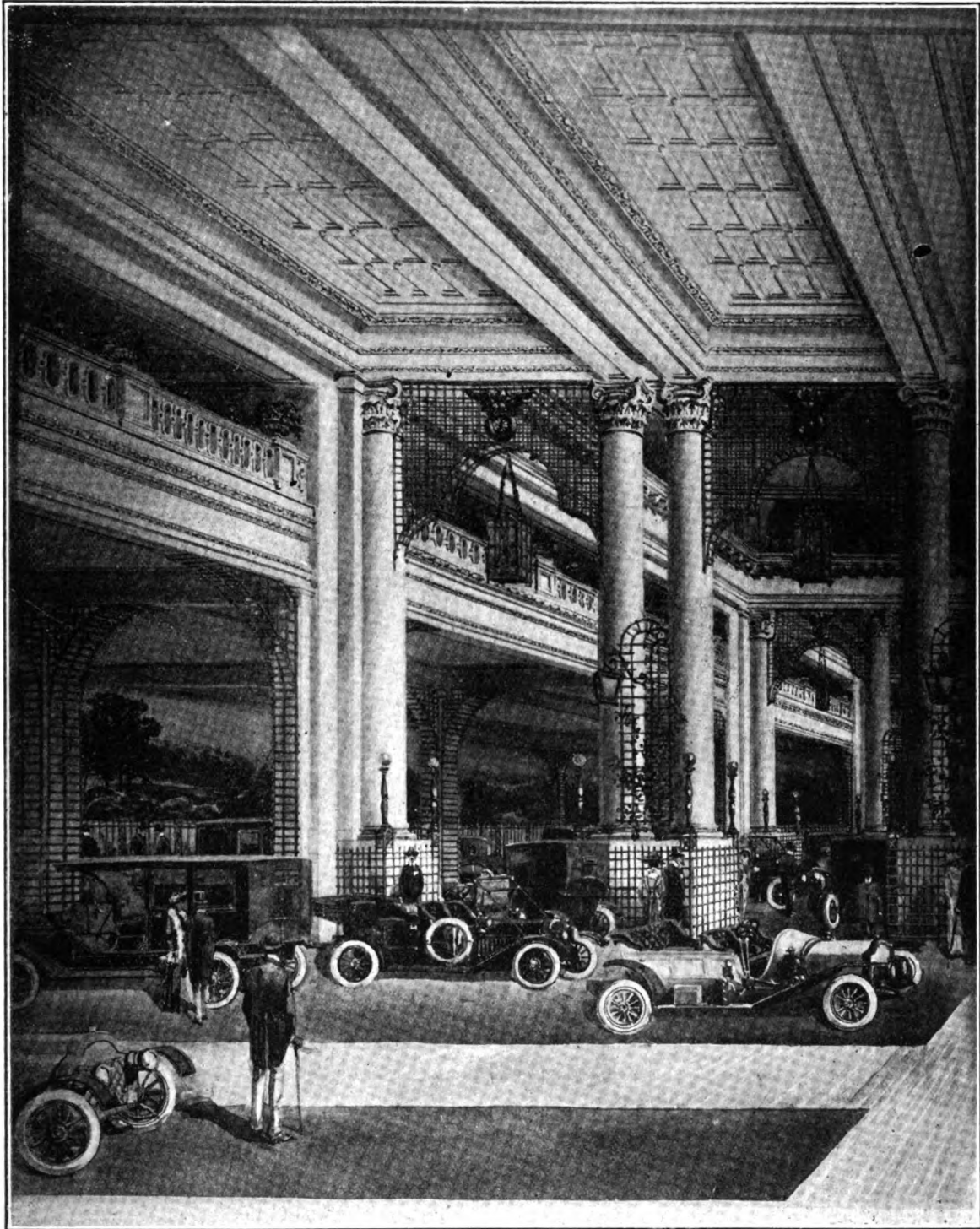
TWO SHOWS IN ONE.

**Gigantic Exhibition of Automobiles and Accessories
In New York.**

The motoring world has come around again to the time of the automobile show. Like the shows of the

January 20 to 25, commercial vehicles will be shown in both buildings, while accessories will be on display during the two weeks.

That the forthcoming exhibition "in two buildings for two weeks" will eclipse any similar affair held here or abroad in point of number of exhibitors, com-



Decorative Treatment of Grand Central Palace for the Automobile Show, January 11-25.

past two years, the forthcoming exhibition will be two shows in one in both the Grand Central Palace and Madison Square Garden, from January 11 to January 18, which is to be known as the Part One period, passenger carrying pleasure vehicles will be shown in both buildings. During the Part Two period from

prehensiveness and in the total intrinsic value of goods to be shown is now assured by the list of exhibitors just issued by the Automobile Board of Trade, under whose auspices the show is to be held.

The list already shows that more than 530 exhibitors will make up the displays in the Garden and Palace.

On the Garden list there are 43 makers of pleasure vehicles and 272 accessory concerns exhibiting in this building the first week. The Palace, during the first week, will have 46 or more exhibitors of complete pleasure cars; 25 displays of motorcycles and more than 100 accessory displays. During Part II, 25 companies will show complete commercial vehicles in the Garden, while the Palace will house models of 41 truck manufacturers. In each building the majority of the accessory makers will exhibit the entire two weeks.

Every inch of space in Madison Square Garden has

wrestle with transportation and delivery problems. The Garden representation of commercial vehicles, are most of them veterans of the industry.

Simultaneously with the display of trucks in the Garden, Part II period in the Grand Central Palace will be in full swing with trucks and wagons. The exhibit of motorcycles of the pleasure and utilitarian types in the Grand Central Palace during the Part I period will be a comprehensive one.

In order to make the New Grand Central Palace more attractive and appropriate for an automobile show than ever before, the entire interior, including



How Madison Square Garden will appear at the Automobile Show, January 11-25.

been contracted for by manufacturers and dealers, and there is a consistent clamor for more room. All told, there will be more than 2,000 products of various makers displayed, inasmuch as some of the exhibitors exhibit a large line of goods.

Nearly all of the makes which have been exhibited at the National shows in Madison Square Garden for several years past will be seen in the same building this season. The new Grand Central Palace will show many makes which were seen in the Palace last year and which were exhibited in the old Grand Central Palace before that building was torn down.

Part II, beginning January 20, will be a Mecca of thousands and thousands of merchants who have to

all of the floors, is to be redecorated. Madison Square Garden also will have an entirely new scheme of decoration.

There will be an added feature at the forthcoming show. During the Part II period, or second week, beginning January 20, which is devoted to commercial vehicles, it has been decided to hold a machine tool exhibit. After a conference with President Bullard of the National Machine Tool Builders' Association, and with the approval of the Executive Committee, the Show Committee of the Automobile Board of Trade, reached this decision early this week.

The Society of Automobile Engineers, most of whose members will be in attendance at the show for

the entire two weeks, have expressed themselves as much in favor of such an exhibit as it is an ideal time for machine tool builders to reach the men who are vitally interested in their product.

SOME SELLING PROBLEMS.

The Question Discussed from a Bright Manufacturers' Standpoint.

From Hugh Chalmers, Chalmers Motor Co.—At the outset I should say to you that I realize it is always easier to locate problems than to work out the correct answers to them. No doubt all of you are conscious of selling problems in this business. If selling problems could be eliminated from business we would be getting near the millennium and could go on long trips to Europe, or on other delightful excursions, without worrying very much over what we had left behind us. Very likely I shall not point out to you a single new selling problem, and, still more likely, I should probably only make myself unpopular if I did. My secretary, who keeps my personal account books, used to give me an itemized statement of personal and family expenditures. As the cost of living began to mount higher and higher I found a perusal of that statement of expenditures more and more distressing from month to month, until finally I told him I didn't want to see any more statements of expenditures—that they worried me too much—but to leave me have simply a statement of how much money I had left in the bank, if any.

Doubtless we all feel the same way about seeing or hearing of any new selling problems. If there are any new ones, we would almost prefer not to know them.

But, after all, we can't solve our problems by ignoring them. We have got to face them. Nor can each of us working alone solve the big, common problems of our industry as quickly or as well as all of us co-operating together can solve them. It is by discussion and the exchange of experiences, and by co-operation along broad lines, that we can all make progress most rapidly. So perhaps I shall, after all, have done my full duty if I but succeed in pointing out the problems, leaving the solutions of them to crystallize from the discussion which will follow in this meeting and in other meetings, and from the continued efforts of all of us.

Our selling problems may be roughly divided into two classes—first, those the solution of which can best be accomplished by the manufacturers as a whole working together; second, those in the solution of which each company must go its own way and find its own best methods. It is the first class, very naturally, that we should consider here.

We are led to the first problem worth our while to consider by the question, "What is selling?" What constitutes a sale?

It seems to me that selling—selling a motor car, for instance—is something more than simply exchanging a motor car for a check or for so much cash. This may be merely a friendly transaction; or an exchange, fair or unfair; or perhaps a bit of charity or philanthropy. Selling, real selling, is the disposal of goods at a profit. Anybody can give goods away, but selling things at a profit is a job for good salesmen and good business men. Let us keep this point in mind.

Now, gentlemen, business exists for the net. It is a nice thing for those who like it to build up a great volume of gross business merely for the sake of talking about it, but the final test of success is in the net figures. The prime object for which we are all working, therefore, is to make money.

The Dealer and His Problem.

Now, most of us do business through dealers, and most of us doubtless will continue to do business that way, in large part at least, for a long time to come. The dealer, then, and some of his problems represent our first big problem. It seems to me that automobile dealers are of more vital importance to both the manufacturer and the buyer than is the dealer in nearly any other line of business. The right sort of automobile dealer is harder to get than a good dealer in other lines—that is why he is so vital to the manufacturer. And, again, an automobile dealer is needed more by the buyer after the purchase than is the dealer in any other line—that is the public's vital interest. Both the manufacturer and the buyer, therefore, are anxious to have a good dealer and to have him remain so. A good dealer won't remain good long unless he can make some money; unless his business will show a net profit. Either he will get out of the business, or he will simply drift along for a time, only to fail entirely in the end. How, then, can we help our dealers make money?

Well, first of all, we can impress upon the dealer's mind the thought that he is in business to make money, and that he should conduct his business with an eye to the net profit. Once he has got his ideas, it should be pointed out to him that he has little chance to make a profit unless he gets the list price. I am thoroughly convinced that we, as manufacturers, should take a firm stand for the list price.

Establishing a list price and getting it is, first of all, a matter of setting our prices as low as we can, considering conditions of competition and consistent with our own profit; and then fixing a fair and not too long dealer's discount. I believe heartily in a liberal discount to the dealer. He is entitled to a margin that will give him a fair chance to make money. But my observation and experience teach me that fictitious pricing and unusually long discounts are wrong policies. They may produce results that seem satisfactory for a time, but in the end they lead to trouble and usually to failure. The evidence on this point, not only in our own business but in every other line of business, is so plain and conclusive that the point requires no further debate here. Prices that are fixed in order to provide leeway for long discounts to dealers and for slashing to the buyer, either directly or through undue liberality in trades, are demoralizing to our whole business. They make for unfair competition. They harm the dealer who is trying to conduct his business on high standards; they tend to make dissatisfied owners; they throw an atmosphere of insincerity and bartering and slipshod methods over the whole industry. They should be entirely eliminated.

With a product fairly priced, the question of getting the dealer to work on the one-price-to-all system, and that the list price, is simply one of education. The courts have decided that a manufacturer cannot force a dealer to get the list price. So it is a question of education and discipline. Many dealers are wise enough to see for themselves the necessity of the one-price system. Many more are not. Some factory executives with whom I have talked take the attitude of "Well, what difference does it make to us?" We want volume. We have dealers for the purpose of selling cars, and as long as they sell them and give us our profit, we are not worrying about whether they make money for themselves or not."

This strikes me as a very short-sighted policy indeed. In our company we feel that too much of our success hinges on the success of the dealer for us to ignore him, let him go his own way, and pursue wrong policies simply because he is playing with his own capital rather than

with ours. It seems to me that all manufacturers should take a firm stand on this matter of prices.

Of course, I realize that there are times when lowering of prices becomes absolutely necessary. Odds and ends must occasionally be cleaned up in our business as in any other. Supply and demand will not always absolutely tally. At other times overproduction will make reductions absolutely imperative.

Over-Production.

This leads me to the conclusion that overproduction—or, rather, how not to overproduce—is another of our selling problems. I am not one of those who think there are no limits to the number of cars that can be sold if produced.

The way to be surest of selling your entire output at a profit is by being sure that output will come within a normal demand. Forced selling is rarely, if ever, profitable. There is bound to be a time reached when this country's market for new cars is going to be very much smaller than it has been in the past; and if we are thoroughly alive to our own best interests we will study conditions very carefully and base our production schedules on what we actually know and can intelligently foresee, rather than on guesswork or on what overenthusiastic distributors think they can sell.

The number of cars a dealer can sell in your office is quite different from the number he can actually sell in his territory. We will have enough selling problems always without overproduction, so let's underproduce rather than overproduce. This is not a question that can be settled by this organization, but one which each manufacturer must study and settle for himself. And if most of us settle it right there will not be much temptation toward price-cutting.

Second-Hand Cars.

Another of the great problems of our business is that of handling second-hand cars. No doubt it is a common occurrence with all of you to have your dealers complaining that an ever-increasing percentage of their sales involve trades. You all know what this means. It means usually the making of two sales in order to earn one profit, and, unless a dealer is very careful and a shrewd trader, it is apt to mean two sales without any profit. No end of automobile dealers have traded themselves out of business. Automobile selling very often gets down to a question of whether the man with a used car is a better salesman than the dealer who is trying to sell him a new car, and it not infrequently happens that the owner proves to be the better salesman, selling his old car to the dealer at a better profit than the dealer makes in selling the new car to the owner.

All dealers say that this trading and second-hand problem is one of their biggest ones and that it is getting bigger all the time. Yet when you ask them what can be done about it, or what suggestions they have, most of them are unable to offer anything encouraging. One man will tell you that the only thing he sees that could be done is to establish some such system as is said to prevail in the typewriter business—just arrange so that a lot of machines could be returned to the factory each year and broken up. But, of course, we know this could not be done in the automobile business. There is too much value in used cars, and the waste in junking any considerable number that are still in shape to give service would be entirely too great. Another man tells you that all he knows is to have a good warehouse fire once in a while. Another man tells you that the only way he knows is simply not to trade at all at any time. Yet we

know this is out of the question, too, as a permanent policy.

In other words, there seems to be just a hopeless feeling among automobile dealers on this question a feeling that it is one which is always going to be troublesome and about which nothing can really be done. I am by no means convinced that something cannot be done. I have the following suggestion to offer:

When conditions regarding railroad rates became unbearable, the government appointed an Interstate Commerce Commission to make a careful study of railroad and shipping conditions, to adjust rates, and to act in the interests of all users of railroads. When we wanted to go into the tariff question thoroughly, we appointed a tariff board to make a scientific and expert study of this always troublesome problem. It seems to me that some of our problems, and especially this problem of second-hand cars, are analogous to the national problems of the railroads and the tariff. May I suggest, therefore, the advisability of considering the appointment of a committee from our members to go into this whole subject very thoroughly; to study it in a careful way so that we may know whether it is possible to adopt any policies or measures that will help all of us and all of our dealers in the handling of this problem. We all have opinions on this question, and yet I feel that these are haphazard opinions rather than logical conclusions based on known facts. It might be that a commission such as I have suggested would find that the best thing that could be done is simply to let each company go it alone in this second-hand problem, as at present. Yet, on the other hand, it might acquire information that would be valuable to all of us, and might be able to work out some plan of co-operation—although I do not attempt to say what it might be—which would give very good results for us all.

Weather Affects Sales.

The greatest obstacle to the sale of automobiles is a natural obstacle, and one which we can never entirely overcome. This greatest obstacle is bad weather. The weather makes ours a seasonal business, and any business that is seasonal has selling problems which an all-the-year-around business doesn't have. We cannot change the weather, that is plain. But we can take measures which will minimize the effect of fall and winter weather on our business. The first thing I believe we should do is to change our own seasons. I am one of those who believe in yearly models. This question will be debated here and I am not going into it any further than to say that in my opinion yearly models are still desirable. But I am coming to believe that we have picked out the wrong time of the year to announce our yearly models. If you will look over your business for a number of years and take your sales from January to January you will find that the curve of sales is a camel-backed affair with one end in January and the other in December, with a rise from January to an apex in May or June; then a violent slump for thirty or sixty days, with a steady rising through the late summer and fall to an apex in October, and after that another falling away to the mean level of December and January. I believe that this will always be true as long as we announce new models in the summer.

Next to the very car itself, the greatest selling force we have is warm weather and sunshine.

Our sales curve should be a semi-circle, with its apex in July, which, by reason of the weather, is logically the best season for selling automobiles. But it is not. The reason our sales curve has a camel back is that our production curve is that way.

Our production plans are wrong. Look at your curve

of production. You will find it also has two humps—one in the spring and one in the late summer and early fall. It is at its lowest point in midsummer when it should be highest, because we end our season then and start on new models, which always come slowly at first. In other words, we get our maximum production in the poorest selling season, and our minimum production when sales should be highest. When the weather is most favorable to big sales, we are engrossed with the new models.

These conditions are not right. It is to our interest and certainly to the interests of our dealers to make our biggest deliveries in the heaviest selling season. I think it is time for us to consider very seriously whether we ought not to announce our models just before January 1, rather than in July. One company alone would hardly dare change the custom, or even two or three companies, for that matter. This is a thing which, if it is to the interest of all, should be done by all together, all of us agreeing, say a year in advance, that we are, after a certain date, going to make our announcements not earlier, say, than the first of December, rather than in July. I think that if the change is made an agreement should be reached that the new models be announced not earlier than December 1 or possibly December 15. Announcements prior to that time would, I believe, tend to stop business too early in the fall. Our business year is, you might say, really a ten-month year, when you get down to it. We all of us aim to have a gap between seasons, and it seems to me it would be much better to have this gap come in midwinter, rather than in midsummer.

This plan also would revive interest in the shows. The shows would then return to their original purpose, namely, that of displaying new models for the first time to the public. The production of a new model is always slow getting under way. This unavoidable slowness would not make so much difference in December or January as it does in July and August.

There would be less storing of cars.

We would have a long, uninterrupted season of production and selling. We would get under way gradually and our production curve would reach its highest point in the same months the selling curve naturally would reach its highest point. We would not have to put on tremendous force for a few months, only to let down when the cold weather comes on. We would start our campaigns in the cold weather and gradually build up as the season naturally opened. It seems to me that there are very many arguments in favor of this plan and very few against it. I should like very much to hear a discussion on this point.

Good Roads.

There is yet another way in which the effects of bad weather on the automobile business may be offset. That is through good roads.

Cold weather, in itself, is not necessarily a great deterrent to motoring; but the condition of most of our roads outside the principal cities is deterrent. I realize that getting good roads—at least to any great extent—is a slow and laborious process. But I know of nothing the automobile industry needs more than good roads.

Mr. Chapin will talk fully on this subject a little later, so I do not intend to attempt to go into it deeply. Yet I do want to take this opportunity of saying that, in my opinion, we should bend every effort in behalf of good roads, especially in the great middle west, where so many motor cars are sold and where the roads generally are so bad. A national system of good roads

would, I should say, increase our winter deliveries at least fifty per cent.

Another problem of selling in which I believe we are all vitally interested is that of advertising. Many seem to think that advertising is an easy thing to accomplish and that it is an easy way to assure sales and success. I must confess that I have found good advertising extremely difficult to accomplish. I have also found that many, many things besides advertising are necessary to make a success of a business enterprise. Advertising is not the answer to all business problems as many advertising agents whose tongues are more eloquent than their brains are logical would have us believe. Some splendid business successes are still built up *without advertising*. It is true they are rare but there will probably not come a time when this condition will not be true.

Automobile advertising has suffered from mediocrity, just like other kinds of advertising—whether more or less, it would be hard to say. What automobile advertising has suffered from most, however, is exaggeration. Perhaps some of it has suffered from more than exaggeration.

Of nothing am I so thoroughly convinced as that the greatest single factor in successful advertising is absolute honesty and sincerity of statement. I question whether we like the advertisement which exaggerates, any better than we like the person who exaggerates. I question whether we like the advertisement that brags and blusters and blows, any more than we like the person who has these undesirable traits. I question whether we like the advertisement which is egotistical and uselessly wordy any more than we like the person who is that way.

Advertising is the expression of the character of a business. It is simply a business standing up and expressing itself to the people. Why should the rules of what is proper in an advertisement be different from the rules of what is proper and admirable in a person?

Honest Advertising.

The public gets its impression of the automobile business, as a whole, very largely from our advertisements, and therefore, it seems to me to be of the utmost importance that we try, all of us all of the time, to put out advertising that has the qualities of honesty and sincerity and simplicity. I don't believe that the public is fooled one bit by misleading automobile advertisements. For example, I don't believe that the public thinks that anyone sells an output of thousands of motor cars in twenty-four hours' time. I believe the public is well enough informed now to know the difference between estimates of dealers and contracts of customers. I believe the exaggeration that has taken place in the past, and which is taking place today in some few instances, is hurting our business. It has in the past encouraged people to go into the business who were neither fitted for it nor had capital enough to finance it, and the character of some of this advertising gave the whole business more of the phase of the Coney Island circus than should be given by the third large industry in the country.

I realize that some may think that I am in a glass house when I say this. Perhaps the advertising of the Chalmers Company has not always been free from some of the very faults which I am talking about; yet I want you to know that we are honestly trying to make Chalmers advertising thoroughly honest and sincere, and that we try always to express ourselves in such a way as not to be accused of "knocking" anyone else, or of say-

ing anything that is detrimental to the automobile business as a whole. This is a competitive business, and I hope it always will be. I believe in honorable competition. While we must all go our own way to a certain extent, and while we all compete with one another, and always will, yet there are some broad principles which work for the good of all of us, and it is to the interest of all of us to co-operate with one another along these broad lines.

We have a great business, gentlemen—I believe the greatest in the world. However, our business is subject to the same commercial laws as any other business. It requires the same keen business judgment to direct it, and requires sufficient capital, the same as any other business. We used to think that anyone who could lead a horse to water could run a farm, but in recent years we are realizing that it requires just as good business judgment successfully to run a farm as it does successfully to run a business. Of course, there will be failures in the automobile business, just the same as there are failures in every other business. It seems however on account of the great amount of publicity given to our business, that failures in our line are more accentuated than are the failures in any other. Concerns will continue to go out of the automobile business, for one reason or another, but I honestly believe that the future was never so bright for those who run their businesses according to business principles; who look upon their business as a serious business, and who look upon the automobile manufacturer as filling one of the most essential demands of our present civilization. The future is bright for the concern which gives a dollar-for-dollar value in the car that it builds as well as in the advertisement that it writes. The future is bright for the concern that realizes that the day of unduly high prices and big profits is over; that the business is down to a bed-rock basis, the same as any other industry.

I believe the companies that are doing the most business to-day are those who have recognized this for several years past and who are building for the future; who are in the business permanently and laying their business policies not only for this season's output, but are far-sighted enough to see ahead the effect of what they are doing now on many seasons yet to come.

I think it is a fine thing that we can meet together in this way as friends, although in business we are competitors, and talk over our problems and mutually agree upon the best ways of meeting them. Men outside of the automobile business often marvel at the friendship and the spirit of co-operation that exists among the automobile manufacturers, but I think it is one of the finest things about our business. It is a new thing in business. Perhaps it is one of the many good things that our new business has brought with it into the business world, and I only hope that the time will never come when conditions will be any less pleasant for all of us than they are now, or when we shall cease to be friends, or when we shall no longer meet together to conserve our interests and safeguard, as well as we can, the great investments we all have at stake.

A Great Public Benefit.

Will nothing disabuse the minds of the unthinking that the automobile has been a public injury? This claim is still being made with candor and confidence.

The creation of a gigantic industry of greater volume than the civilized world has ever before experienced during a similar period of time, seems to be given no consideration whatever. The only fact that

many people seem to harp upon is that individuals have bought automobiles when they could not afford them. Just as if people in every channel of life were not every day buying things they cannot afford, and just as if in this age of prodigiously efficient productive capacity that the creation of new things that the people need and want and will have is not essential to the general welfare.

Hundreds and hundreds of millions of dollars have started at the financial top, so to speak, since the automobile industry was established, and with the exception of a very small per cent., they have filtered down through the channels of industry and service until they have reached rock bottom. The first to start these millions going is invariably the capitalist, and gradually the gigantic mass of collected money spreads out, trickling down to engineers, inventors, foremen, mechanics and laborers. From these it widens still more, to the baker, the butcher, the grocer, and the manufacturer of other things that those of moderate means need and will have, provided they have the money to purchase them.

Admitting that the automobile has impoverished some who were unable to own one, just as pianos and horse vehicles, and silks and laces, and what-not have impoverished others, yet the fact remains that the car of today will give a greater return in actual value than anything else of an equal cost that is made.

Of course, the purchaser must have use for it; as a pleasure vehicle solely the car is only for those who have means enough to purchase something else for pleasure of about the same cost, while as an instrument of "sport" or of a "game" it probably stands next to a yacht in its luxurious expensiveness. But for business there is nothing that begins to compare with it in the returns it will give for the outlay it requires.

The automobile appeared just when the time was ripe for it, just as so many other great inventions and discoveries have come along opportunely and in response to a well-defined public need. An element of progress and of public utility it ranks fully as high as the steam locomotive, the telegraph, the telephone and the sewing machine.

Rubbing and Pushing.

For the past three or four years the worm drive has received a good deal of attention abroad, and it has attracted more or less interest in this country.

Our readers well know that we have on different occasions expressed our doubt as to the efficiency of the worm mechanism. We have been unable to understand how such a form of power transmission could be constructed without a good deal of friction, and cannot now understand it. But we have no opinion which we will not willingly exchange for the truth, and must now acknowledge that if the reports of engineers and other experts are worthy of acceptance, this worm drive has an efficiency of about 95 per cent.

Although at a loss to understand how this can be, we are willing to sit at the feet of engineers who have made honest tests and listen. That the worm drive is more smooth and silent than the bevel must be admitted; that it is claimed to be an economical means of power transmission or drive is also well authenticated.

But just how the rubbing together of two pieces of metal engenders no more friction than the pushing of one against the other is beyond our comprehension.

MOTOR WAGON BODIES.

Specifications for Making a Variety of Useful Styles for Commercial Work.

The length of this patrol body on the sills is 7 feet; length of sheet iron bent dash 20 inches; rear end depth under the seat 15 inches, and front depth under

and the rear end bar is $2 \times 3\frac{5}{8}$ inches. All cross bars have $\frac{1}{2} \times 2$ inch long tenons, therefore, all must be 42 inches long. At the front end there are no bottom boards at all; under front seat the bottom boards run across, and rear of seat the four bottom boards run lengthwise.

The sides are framed, paneled and molded; the in-

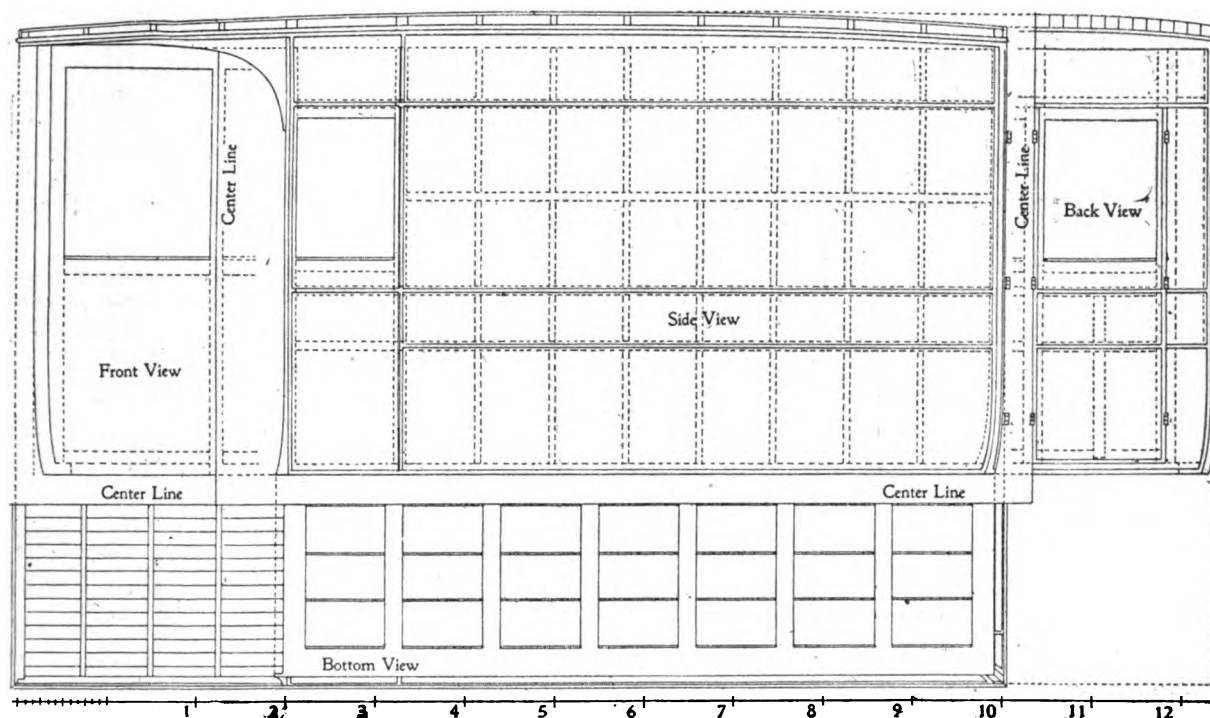


Fig. 1.—A Patrol Wagon Body Without a Top.

the seat 28 inches. The width of the body on the sills is 50 inches, and outside of the lazy backs is 58 inches. The bent iron dash is narrower than the

side posts are 1×2 inches, framed with tenons in sills and also tenons on the upper ends. The upper lengthwise pieces are $1 \times 1\frac{1}{2}$ inches. They are also lapped on

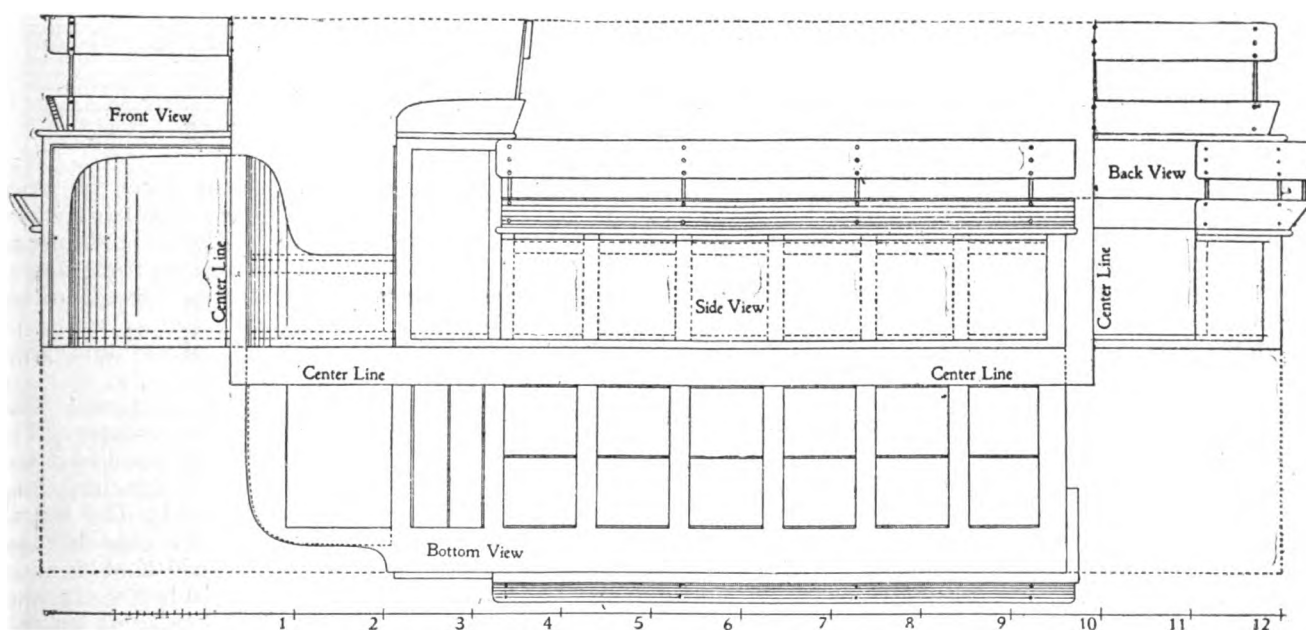


Fig. 2.—A Motor Store Wagon Body with Front Division and Double Hinged Doors on the Rear End.

sills, which can be seen best on bottom view, and is indicated by dotted lines.

Construction of the body: Dress the sills $1\frac{3}{8} \times 6$ inches; all cross bars $1\frac{3}{8} \times 2\frac{3}{4}$ inches except the end bars; the front bar is $1\frac{3}{8} \times 6$ inches, curved as shown,

both ends as shown on the side view, but mortises are preferred. The opposition to tenons is that the shoulders of the posts run parallel with the panels and therefore may split; but the joints are not supposed to move under the panel. The seats are 13 inches

across, $\frac{7}{8}$ inches thick, and 6 feet 6 inches long. They rest on the body and lengthwise bars which are $1\frac{1}{4} \times 2$ inches, framed into the seat posts front and door posts back. For less expensive work a board is used and the entrance is made from the heel board, but for the better class of work each seat is framed with three pieces, two end and one lengthwise. All are $\frac{7}{8} \times 3$ inches. The tenons are on the long pieces. Into this frame a seat board is fitted, hinged to the frame with four hinges, and in front they rest on the lengthwise bars. If anything is wanted that is stored in the boxes it can be easily and quickly removed. They are also built with doors on rear ends when stretchers are carried, which are made to fold put in, or taken out from rear ends as it is handier than from top of seats. There are always two stretchers car-

of the body is the same as on a horse drawn wagon, except the rear doors which is an innovation only recently made. The constructions for the rear doors differ considerably. They are made with one door from 24 to 30 inches wide, or, two doors from post to post. Or, a lower and upper gate, the lower drop and the upper lift. On this draft there are two doors, hinged in the center and on the right side of the body and locked on the left side. At the center the right side door is locked simultaneously top and bottom, worked with a regular door handle and on the left side is a regular door lock, or one as at the center. In fact, wagon doors are better locked top and bottom. The back view will explain the hinge part. On such doors the glass can be made stationary, without and with frames or glass frames made to drop.

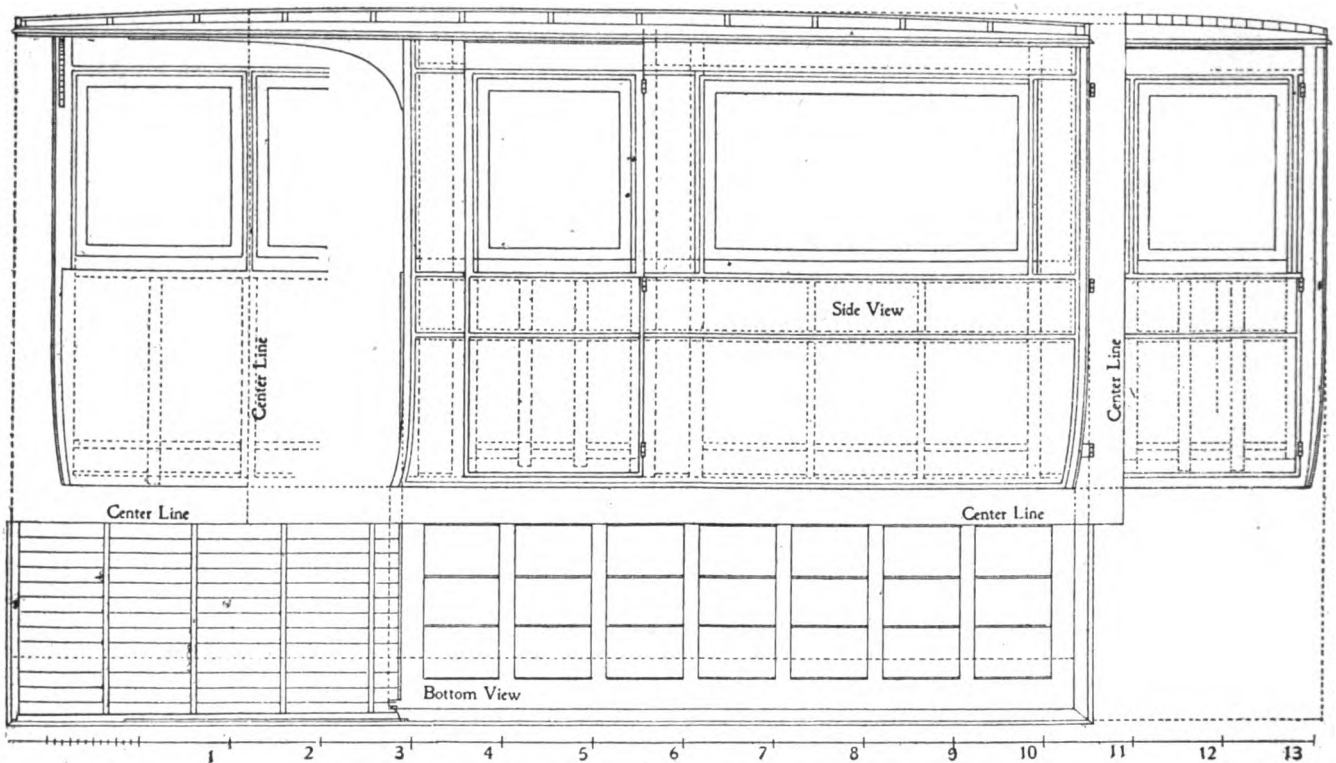


Fig. 3.—A Motor Ambulance Body with Side Doors and Glass Frames to Drop in All the Four Doors.

ried, one on each side. The side and rear end seat boards are framed similar to a buggy seat. The front surface below the front seat is inclosed with a $\frac{3}{4}$ inch thick board and joints, covered with small moldings as shown on the front view. The front corner posts are $1\frac{5}{8} \times 2$ inches and the rear seat posts $1\frac{5}{8} \times 1\frac{3}{4}$ inches.

A motor store wagon body with front division and double hinged doors on the rear end:

This body, also the one just explained, can be used either for electric or gasoline, also with stationary seat, the same as on the autocar or with extended sills in front when driven by electricity. When used on an autocar chassis on which the seat is stationary outside of the front posts of the body, the stationary windows in front are closed up, but when used for an electric driven vehicle the body is built as designed. There is a shifting front on this body shown on the front view. This front is fitted between the two posts and secured with four locks. When the body is built on an autocar chassis the front is fitted between the front posts; when for an electric the front is fitted in the rear of the lights. Otherwise the construction

On a body of this style the side panels can be made in five parts for each side, making four joints of which three are covered with moldings. For the doors on rear end the panels are put across but on the sides up and down, and one single panel can be used from top and bottom.

Motor ambulance body with side doors and glass frames to drop in all four doors:

This ambulance body is built for a 33-inch wide gasoline chassis but can be wider or narrower. The outside length of this body without the hood is 7 feet 7 inches, and length of hood 4 feet $3\frac{1}{2}$ inches, long enough for a storm front or wind shield. The length of the body is divided as follows: From outside front corner post to door joint 8 inches; width of door 24 inches; from rear door joint to window 8 inches; length of window 43 inches and 8 inches again on rear end making 7 feet 7 inches or 91 inches. The width across the top is 52 inches and across the bottom 49 $\frac{1}{2}$ inches making the amount of turn equal under on each side $1\frac{1}{4}$ inches. The inside length on the bottom when the rear doors are closed is 7 feet 2 inches, deducting the amount of padding front and rear. The

inside width across the bottom is 46 inches, which is considered sufficient room for two stretchers, making each stretcher 23 inches.

Construction of the body: Size of sills $1\frac{3}{8} \times 4$ inches; six inside cross bars $1\frac{3}{8} \times 2$ inches. Two end cross bars 2×3 inches and six bottom boards $\frac{5}{8} \times 7$ inches. Or the bottom sides can be made 2 inches thick, the rest as above. The thickness need not be filled up to make it level with the bottom boards which is stronger and better.

On this body are four end posts, eight door posts and eight standing posts. The front end posts have turn under on one side only. The curved part in front is obtained with the panel. The rear end posts have turn under from two sides but both are alike. The sixteen door and standing posts are all the same

across, three persons for each seat, making nine in all, and two on the stationary seat. Each seat can be made 50 inches across out to out, which gives sufficient room for three persons for each seat. The wide body or upper part is cut directly above the narrow body or lower one and is fastened with flat dowels made stationary with a thumb-screw so it cannot lift when the body is jolted. In front the lower and upper body is closed up to 9 and 12 inches fitted to the posts as shown on the bottom view. The posts are fitted the same on rear end, but is open and a drop gate fitted to a space of 30 inches on lower body. On this end there are two flat dowels, so as to keep it perfectly stationary to lower body. This space on which the upper body rests is 6 inches only, but the two posts and the 7×12 -inch boards will prevent the side motion

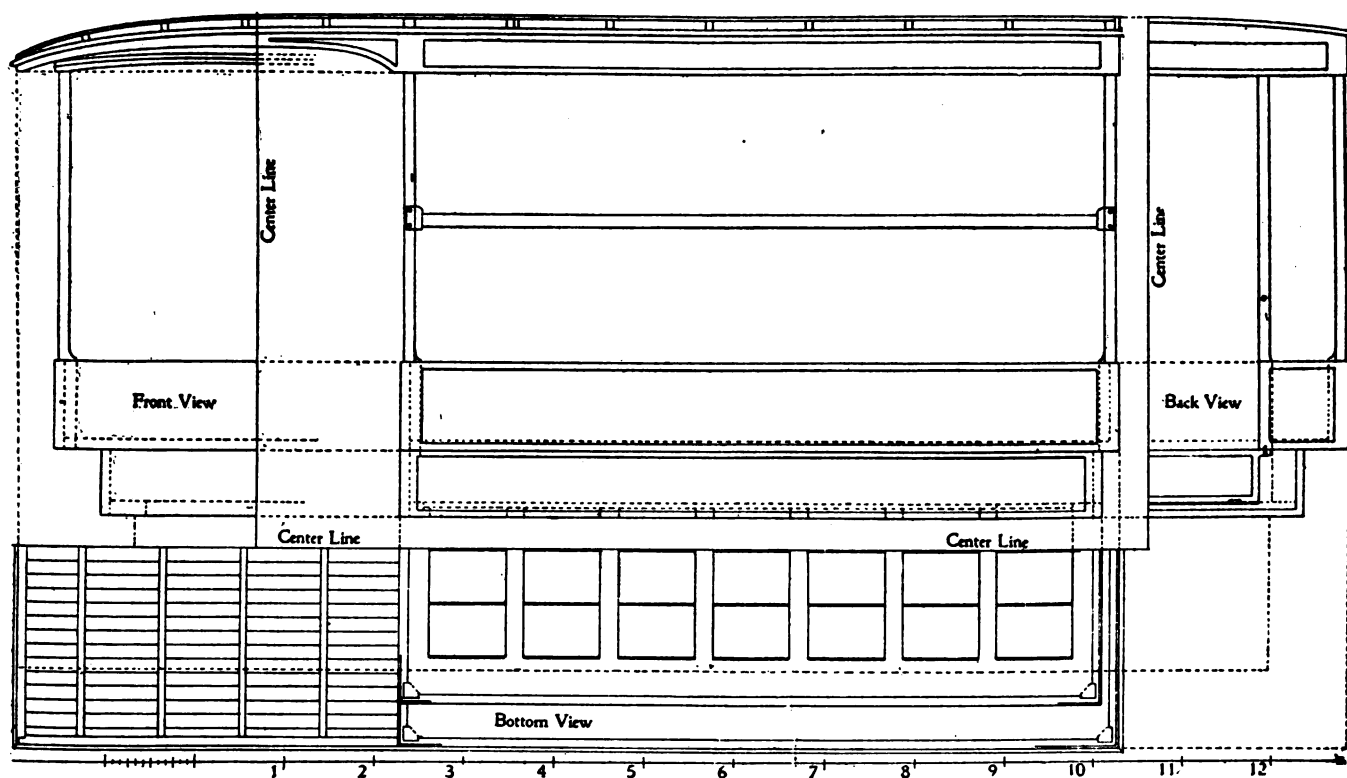


Fig. 4.—A Motor Furniture Interchangeable Wagon Body.

shape and thickness which is $1\frac{1}{2}$ inches. The inside shape and size is obtained by counting the thickness of molding, the position of glass frame when up and down and thickness of inside cross bars. The most important part is that the glass frame slides up and down without coming in contact with any of the cross bars and inside lining board.

All standing posts are mortised into the sills and on top are lapped to the top rail. All ambulances built at present are lined with panels on the inside, padded a trifle, and covered with pantasote, which can be sponged without injury to the goods. The glass frames are painted and the glass frame lifters are also made of pantasote. The bottom is either covered with sheet copper or linoleum.

Motor furniture interchangeable wagon body:

Bodies of this kind are best fitted to gasoline chassis, where the front seat is stationary and outside the front posts. This body is made in two parts, upper and lower. The upper part is lifted when not needed, and when the lower or a light body is better adapted. With the upper part off, three seats can be placed

when fastened to the lower body. The 12 inch deep sides, front and back, are all 1 inch thick and are lapped to the posts as shown on the bottom view, well screwed, which are covered with moldings. The joints of all the boards are shown on the bottom view also glued and screwed to sills and cross bars, and all screws covered with moldings with sides 1×9 inches, sills 2×5 inches resting on the chassis, 3,000 pounds can be carried which is needed on such a body, because the upper part does not carry any weight, the stability must be all on the lower body.

Why His Car Runs Better.

From J. H. Hood, Illinois.—From information obtained from one of your magazines, I tapped a gas pipe from the upper side of the exhaust pipe, along side and above the carburetor, on my 1910 Reo, which is worth five years' subscription to your paper for that suggestion alone, as my car runs fifty per cent. better.

STEAM CAR DEPARTMENT

This department is intended for owners, users and others interested in the steam car.

Those who have trouble with their steam cars are asked to give clear and full particulars, and their queries will be answered as correctly as possible by an expert. It will be considered a favor if our readers will contribute to this department, giving such information as may be useful to others using the steam car.

Has "Liver" Complaint.

From W. M. Stewart, Oregon.—In your November issue, Mr. N. A. Carter of Mississippi, has a White steamer with liver complaint, so we will treat the liver and this will cure all his troubles. He will know the liver as a thermostadt. Loss of power after high speed or a hard pull means liver doesn't work. Excess overthrow of steam at the exhaust check probably the same. There should be no more steam than the condenser pump will care for except at the moment of starting with under-heated parts. If this check is set over, strong back pressure will result in the loss of power and cause a leaky condenser. If set too light, you throw over a lot of good hot water. The steam element of the thermostadt ends with the stuffing box. This must be packed just tight enough to avoid steam leak. Any more means destroying the action of the element. The water element controlled by the steam element in turn controls a supply of water direct to the boiler tubes, without regard to any action of the fire. This valve serves beautifully to equalize all conditions of road travel and car. As steam rises in a heat beyond normal, this valve sends the proper amount of water direct to the boiler. As you slow down on level work the valve closes and all the boiler supplies pass by way of the flowmotor, which in turn regulates the amount of fire. The extremes are in heavy work—open the flowmotor, fire valve and thermostadt. On easy level work a closed thermostadt and intermittent flowmotor and fire engine. Again, all of these are controlled by the water regulator, which may be set to operate at any given pressure of steam. For mountain work we use 600 pounds. We think the water valve in the thermostadt, after being lifted, is packed so tight that it will not return to the seat, thus giving direct water to the tubes when you are running light and consequently firing light. Repack this stuffing box, set the cap until after lifting the valve its full distance with a pair of smooth pliers it will return very slowly to place. This condition allows free action and is sufficient to avoid leaks.

Undoubtedly it is your liver, but a somewhat similar trouble could result from false adjustment of the flowmotor, except that an error here must be on the side of overheat while you have wet dead steam. We assume that your pyrometer reads correct and that you have tested with a thermometer. You have some 20 check valves constructed differently for individual needs. If worn get a new ball plunger or stem. A 1-32 inch adjustment can be made with a machinist rule or even soft piece of metal of proper thickness. Check levers are often cured by opening the exhaust valves and pumping coal oil through the line. See that your strainers, especially the one at the entrance of the water regulator, are clean. Metal flakes or dirt cause trouble.

The White Steamer Instructions.

From W. M. Stewart, Oregon.—T. C. Fraley in the November number finds trouble with the 1911 White

steamer, or instructions book. His quotation, as far as distinguishable from personal expression, seems impossible. We will, therefore, ignore the book, except to call his attention to the fact that "expensive" is plainly written "expansive."

In conjunction with the starting pedal, the cut-off acts as a clearance of condensed steam from both cylinders, furnishing steam for the stroke of pistons. Likewise in furnishing steam to both cylinders power is increased—more steam is used—for with this cut-off pushed to the dash, there is practically no cut-off and consequently less expansion. With this lever far back the cut-off is greater, that is entry of steam to the cylinders ceases before the piston makes full stroke and power is then supplied by expansion of the steam already in the cylinder. At the same time the low pressure cylinder is given power by exhaust steam of the high pressure cylinder, a source of great economy if properly handled. The extreme of cut-off will cause the engine to rough or knock; hence this pedal for instant adjustment to conditions. A proper use of it will keep a smooth engine and economize 25 per cent. on fuel. Try it on the road. On reaching a small hill leave the throttle alone, but push this pedal about one-third to one-half, never full (excepting at moment of starting). You will retain speed with only a slight motion of the foot. Try it on a level stretch and see how quick she picks up speed. By the way, your 1911 car is No. 00, and is about perfect if handled right. Finally, warm her up by a hard pull, then place the stop pin as far back on the foot-board as will leave a smooth engine after running slow for 20 minutes. The result will be economy and pleasure.

The Pedal Cut-Off.

From J. H. Coolidge, New York.—I notice in your November number T. C. Fraley is sadly mixed up in the pedal cut-off on his Model O White Steamer. I think if he will read the White directions, he will find that they are entirely different than he quotes them. The cut-off is what they term lengthening or shortening the stroke. That is, when the cut-off is away from the dash the admission of steam to each cylinder stopped before the end of the stroke and the steam works expansively for the balance of the stroke, thus saving steam on good roads. On hills or bad roads, push the pedal forward according to the grade of the hill. When it is toward the dash as far as it will go you are admitting steam to each cylinder the full length of the stroke and of course using more steam and have got more pulling power. Always push the pedal over when starting, as the car will start easier when steam is admitted to the full stroke. When the car gets going, let the pedal back as far as you can and have the car run smooth and save steam. When the cut-off is changed the leads of the valves is unchanged.

Praises His Oakland.

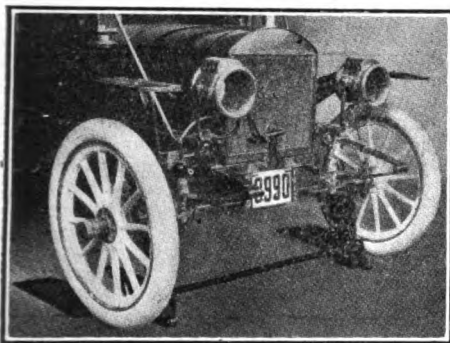
From E. Anthony, Iowa.—I have got lots of information from your paper, although it never had much to say about the cars that are out here. My car is an Oakland. It has been run four years and has never been in a garage, and has never had to be pulled in. Always got back the same day. Runs just as good today as the day I got it, and is on the road every day it is fit for a car to be out.

Subscribe for the Automobile Dealer and Repairer.

The National Power Pump.—This is a handy power pump. It has been brought out by the National Motor Supply Co. To use this pump all you have to do is to take off a spark plug, attach the pump instantly, and start the engine, and a prominent feature of this pump is that not a particle of cylinder gas goes through the pump. You can be sure of filling your tires with absolutely pure fresh air. The construction of this pump is first-class in every respect. Patented "leak-proof" metal piston rings are used. Every valve is carefully ground separately and special connections make it easy to attach. The entire outfit is highly polished and nickel plated. Twelve feet of woven cover tubing are furnished, in the center of which is a high-grade pressure gauge which shows the exact pressure in the tires all the time. The price of the pump complete is \$15. In ordering state whether you want half-inch standard, A. L. A. M. or Metric thread. This pump is put out on trial, if desired. Address your inquiries and orders to The National Motor Supply Co., 1920 Euclid avenue, Cleveland, Ohio, and remember that the same company manufactures a full and complete line of vulcanizers on which they will be glad to quote prices. In writing mention this publication.

Save Your Tires.

The accompanying illustration shows how tires may be saved by using Hart's Automatic Adjustable Auto-Jack. It is a well known fact that when the weight of a big machine is permitted to rest on the tires too long the tires are injured. These jacks are easily adjusted and will



save their cost in tires in some cases within a year no doubt. They are made by C. A. Hart, 520 No. Main Street, Findlay, Ohio, and he wants to send his catalogue "A" giving a full description of this jack to every one of our readers interested.

Pitless Auto Turntable.—This device is manufactured by the Pitless Auto Turntable Company, 9th & Walnut Sts., Kansas City, Mo. It is easily installed and is equipped with ball bearings throughout. Write for catalog and prices and mention the Automobile Dealer and Repairer.

Lawn Mower Grinder.—Repairmen in many parts of the country have an opportunity to make considerable money every Spring and Summer by grinding lawn mower blades. A practical and reliable machine, however, is necessary to do this work properly and such a one is the Ideal Lawn Mower Grinder manufactured by the Heath Foundry & Mfg. Co., Plymouth, Ohio. This machine is fully warranted and is sold on easy terms of payment. Write at once for full par-

ticulars and price and consult their advertisement in this issue.

A New Use for Moving Pictures has been discovered by C. S. Thompson, advertising manager of The Diamond Rubber Company. In order to demonstrate the efficiency of the Diamond Safety Tread Tire, two big sprinkling wagons wet down the pavement for a block and around the corner into the next block. As soon as the street had been made slippery, an automobile with smooth tread tires made the turn at a speed of thirty miles an hour. The car skidded almost twice around while the moving picture man took pictures of the car. A second car equipped with Diamond Safety Tread Tires made the same turn at the same high speed, turning the corner without the least skid. The biograph recorded this feat also. A second test was made by slamming the brakes on hard while the cars were traveling thirty miles straightaway. The car with plain tread tires acted as was expected, skidding round to an about-face, but the Safety Tread Tires on the second car held and brought the car to a sudden stop in three or four feet. The moving pictures will be used in demonstrating the Safety Tread Tire to Diamond salesmen and probably will be shown publicly later on.

No Rim-Cut Tires.—These are made by the Goodyear Tire and Rubber Company, Akron, Ohio. See full page advertisement in this issue. It is said that Goodyear tires are used on 250,000 cars. Their sale has very largely increased since car owners have tested their quality by means of the Odometer. The Goodyear Tire Book based on thirteen years of tire making is filled with facts which every owner of a car should know. The company will send this book to any reader of this paper who will take the trouble to write for it. In writing mention the Automobile Dealer and Repairer.

Sample of Welding Compound Free.—N. D. Doxey, Elmira, N. Y., makes the Anchor Welding Compound. He thinks so much of it that he wants to send a sample free of charge to every reader of this paper who has occasion to use welding compounds. It will weld the hardest steel and is good for both big and little jobs. Write at once and mention the Automobile Dealer and Repairer.

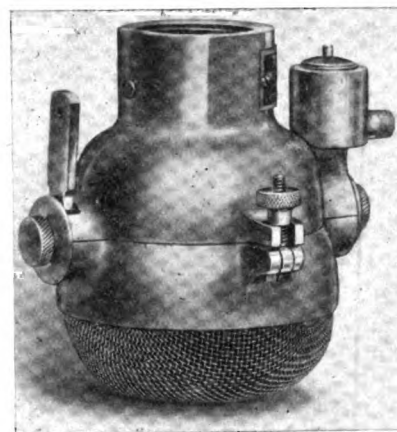
Williams' Quality Wrenches.—It seems hardly necessary to direct the attention of our readers to the rather striking advertisement of J. H. Williams & Co., 17 Richards Street, Brooklyn, N. Y., on our front cover. All Williams' wrenches bear the Trade Mark "W" in a diamond. If you want a Williams' wrench, don't forget to look for the trade mark. These wrenches can be obtained from dealers everywhere, and their reliability is unquestioned. Send for pocket size catalogue which will be forwarded free of charge to any address. In writing please mention the Automobile Dealer and Repairer.

Michener's Gasoline Saver and Primer.—This device is said to save 25 per cent. of gasoline and to increase the speed at least 25 per cent. It acts as a brake on hills. It reduces carbon formation. The manufacturer says it will pay for itself many times over in a season's use. It is manufactured by E. S. Michener, 800 Washington Street, New Castle, Pa. See full page announcement in this issue and write for further particulars mentioning the Automobile Dealer and Repairer.

Expert Automobile Repairs.—If you have a difficult job of automobile repairing which includes the necessity of welding, you should consult the Hub Machine Welding and Contracting Co., 22d and Race Sts., Philadelphia, Pa. This company makes a specialty of electric and oxy-acetylene welding of all broken parts. Aluminum cases and cracked cylinders are skillfully welded in this shop. Transmission cases, intake and exhaust pipes and broken chassis frames are carefully repaired by this special welding process. All work is absolutely guaranteed. Readers should send for the little booklet issued by this company, which is very interesting to any car owner or repair man. In writing for the booklet mention this publication.

The A. B. C. Carburetor.

The A. B. C. carburetor which is one of the latest instruments to appear on the market is an actual innovation. This carburetor works on absolutely new and distinct lines, entirely different from any-



The new A. B. C. Carburetor.

thing that has been in the market up to the present time. It is very simple in its construction, comprising few parts, and is much smaller than other carburetors of corresponding rated size, Style C, 1½-in. weighing only four pounds. The principal peculiarity and advantage in the A. B. C. carburetor is the fact it is absolutely non-adjustable, there being no adjustments of any kind. The manufacturers claim that the same instrument may be placed on any number of different motors, within the range of the carburetor, and each motor will give even better results than it would with the carburetor of the adjustable type.

There is no compensating air valve of any description. The gases have a free passage through the instrument with no restriction, which naturally permits the engine to take in a larger volume of the explosive mixture than is the case in an instrument in which the passages are restricted by spring or gravity-actuated compensating valves. Another important feature of this instrument is that notwithstanding the fact that it is non-adjustable, still the carburetor is being automatically adjusted to every position of the throttle. It actually varies its size to meet the demands of the operator of the machine.

Readers who may desire to obtain further particulars should write to the International Accessories Manufacturing Company, 114 Liberty St., New York City and mention this magazine.

The Modern Automobile. By Victor W. Page. M.E. Published by the Norman W. Henley Co., 132 Nassau Street, New York. Price \$2.50.

Since the advent of the automobile quite likely a score of books have been published concerning its construction, care and repair. A good many of these books are of value, but most of them are lacking in one or more respects. Likewise altogether too many of them have been based upon English works of the same character, and while this is not objectionable, provided the work be well done, it is a decided objection, provided it be done carelessly. The Modern Gasoline Automobile, however, is not only altogether original but unusually comprehensive, especially as it relates to automobile construction. Possibly the departments relating to operation, maintenance and repair may not be any more complete than is the case with some other books of the kind, but taken altogether it is an admirable book, and one which all interested in the automobile ought to have in the libraries. It is written in simple language by one familiar with every branch of the work. It is free from technical terms and things in it are treated so simply that anyone of average intelligence can easily understand it. By the careful study of it one can gain a practical knowledge not only of automobile construction but of operation and repair. Nothing of any great consequence seems to have been omitted. Moreover, with it goes ten large folding plates that add greatly to the value of the book. It contains over 700 large pages and 500 illustrations. The price is \$2.50. Orders may be sent to the publishers, or to the Motor Vehicle Publishing Co., and the work will be forwarded postpaid on receipt of price.

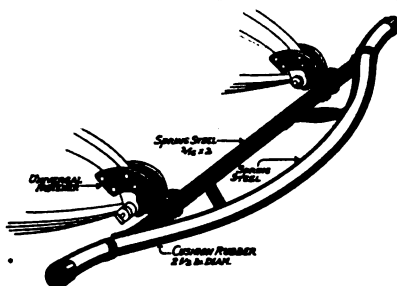
Model Gas Engine Motors.—These are made by the Model Gas Engine Works, Peru, Indiana, whose announcement will be found on another page. The manufacturers say they have found out how to produce a motor that will afford the greatest power with the least weight; that will outwear any car; that is easily started and controlled; that will increase the efficiency of a car. This concern does nothing but make motors and they have been at it for 18 years. It is not to be wondered at then that they know how. If you are having trouble with your motor, write to them and write anyway for their literature, mentioning the Automobile Dealer and Repairer.

The Triplex Starter.—This device is intended for Ford Engines. It is placed out of sight under the hood. All that shows is a small hand lever on dash. You simply have to pull a lever and are off. The manufacturers say this Starter is in no respect a "Hit-or-Miss" proposition but is reliable at all times. But see the full page advertisement of the manufacturers in this issue and write for further particulars to the Bremer-Wilson Manufacturing Company, Department 10, 1256 Michigan Ave., Chicago, Ill. Dealers are invited to send at once for special proposition.

O'Neil Tire Protectors.—We understand that the Original O'Neil tire protector is now obtainable only through the factory's Cleveland, Ohio, Sales Office. This protector is made of five individual vulcanized plies. Write for terms and list of users to the O'Neil Tire & Protector Company, Cleveland, Ohio.

The Auto Cushion Fender.

This is a rubber cushion bumper or fender and in that respect it differs from any other device on the market for protecting an automobile from collisions of every sort. It has many advantages because if a human being is struck by one of these fenders, even if the car is going at a high rate of speed, there is little danger of serious accident, and if a car provided with one of these fenders should strike a tree, post or other rigid



object, the fender absorbs the shock and positively prevents injury to the car. This remarkable invention is being marketed by the Auto Cushion Fender Company of Columbus, Ohio and every reader should consult the attractive double page announcement which appears from this company in the present issue. The accompanying illustration gives some idea of the appearance of this fender, which is being adopted by thousands of car owners as the surest measure of protection from accident or injury to their cars.

Hess-Bright Ball Bearings.—These bearings are built for endurance and are used on some of the most expensive automobiles. An interesting booklet giving the reasons for Hess-Bright durability will be sent to any address on request. This book gives facts not mere generalities. Those intending to buy cars would do well to send for it and see that the car they propose to buy is provided with Hess-Bright ball bearings. A postal card addressed to the Hess-Bright Manufacturing Co., 25 East Erie Avenue, Philadelphia, Pa., will bring their interesting booklet to your door.

"Storm King" Ulster.—It is said by the manufacturers that this Ulster will save four good suits in one year by protecting them from the rough wear given any suit while automobiling. The "Storm King" is wind, rain and dust proof as well as being warm. Write for catalog to the Upthegrove Sporting Goods Company, Valparaiso, Indiana.

The Mossberg Ratchet Wrench.—An unusually attractive full page announcement appears in this issue in which the attention of our readers is directed to the Mossberg Ratchet Wrench, described as a big improvement over previous socket wrench devices. They offer their Universal Automobile Set No. 10, which comes packed in a neat box and gives the automobile user all the necessary sizes of socket wrenches and the new socket wrench handle, so constructed that it gives a maximum of efficiency. Write for catalogue and prices to Mossberg, Attleboro, Mass.

Harris Oil at the Show.—The A. W. Harris Oil Co. of Providence, R. I., will show their full line of lubricants including Harris Oils for automobile, motorcycle, motor truck and motor boat use. Harris Trans Compound and greases will also be exhibited. During last year's

shows, much favorable comment was made regarding the engine and transmission which were part of the Harris exhibit. This engine together with the transmission were operated by a small electric motor. A portion of the crank case was exposed to view through an opening covered with glass. This enabled visitors to the Harris booth, to see Harris Oils lubricating the engine. The transmission was similarly handled showing the gears in actual operation, lubricated by Harris Trans Compound. Because of the interest created by this exhibit last year, the A. W. Harris Oil Co. has decided to again show these essential parts of an automobile in operation in order to demonstrate the effectiveness of the Harris products. An interesting booklet of testimonials will be distributed.

Allen Specialties at the Show.—The Allen Auto Specialty Co. will exhibit the Allen Tire Covers, Lock and Holders at the New York Auto Show. The Allen Tyrometer as usual, will have a prominent place in the exhibition of the Allen specialties. Mr. Allen will also show his new radiator protector—a device that has long been wanted by the motoring public. In fact, each of the Allen accessories presents actual motor car necessities—articles of value and use to the motor car owner.

Royal Equipment Co. at New York Show.—Raybestos Brake Lining, Duplex Brakes and Gyrex the gasoline mixer will constitute the major portion of the exhibit of the Royal Equipment Company of Bridgeport, Conn., at the New York Show. Motorists seem to take added interest each year in the brake question. They realize the importance of good brake equipment. That is one reason why the booth of the Royal Equipment Co. is a mecca each year for both motorists and dealers. Raybestos is the original asbestos lining and it will be displayed in all widths, etc., at the show. Duplex Brakes will be exhibited and their action and mechanism demonstrated. Gyrex is a device consisting of a nickel-steel turbine fitted to a flanged shell. It is mounted on ball bearings and fits the intake pipe. It spins around at great speed and thoroughly mixes the mixture. The little device always creates interest at the shows.

The Silver King Wrench Set.—This is an exceedingly handy set for automobile owners. It has recently been improved and the appearance of the set can best be judged by consulting our advertising columns this month. The manufacturers also produce the Auto Queen Wrench Set, and both of these sets are very popular among car owners. Jobbers and dealers are requested to ask for electros and prices. Address C-M-B Wrench Co., 108½ E. Genesee street, Syracuse, N. Y. Correspondence from car owners is also invited.

Ford Model T Screw Plates.—Every Ford owner should be interested in the special tap and die set for Ford, Model T, cars, which have just been placed upon the market by the Wiley & Russell Mfg. Co., Greenfield, Mass. This set comprises every size and thread used on the Ford Model T, also a stock for every die, and a wrench for every tap; the whole being cased in a neat special cabinet. Write for particulars and inquire for the Ford Model T screw plate. Also mention this magazine.

Automobile and Motor Truck Wheels.—The Eberly & Orris Mfg. Company of Mechanicburg, Pa., make a specialty of automobile and motor truck wheels. They also repair wheels and return them promptly. This is one of the oldest concerns manufacturing wheels in this country and their reliability is unquestioned.

The Hagstrom Priming Cap.—The Hagstrom Bros. Mfg. Co., of Lindsborg, Kansas, have recently brought out an Improved Suction Priming Cup or Auxiliary Cold Weather Carburetor. With this you can start your engine in Zero weather they say on the first turn-over of motor. They say it differs from priming spark plugs and pet cocks in that it does not ruin your cylinders by introducing the fuel in its liquid form. Write for descriptive circular and price.

United States Tires.—In an attractive full page announcement in this issue, the United States Tire Company calls attention to the fact that four-fifths of all the best dealers in the country sell United States Tires and this is a record concerning which they certainly have reason to be proud.

The "Viso" Spark Plug.

This plug is a dependable, sturdy spark plug and it has the desirable "visible spark" feature, as shown in the cut, thus revealing any ignition trouble at a



"Viso" Visible Spark Plug. Made by the Rapp Mfg. Co., 600 Jefferson Ave., Toledo, O.

glance. This plug will be sent postpaid to any reader on receipt of one dollar if you mention The Automobile Dealer and Repairer. Dealers are requested to write for special Dealers' proposition.

Lee Puncture Proof Pneumatic Tires.—One of the most attractive exhibits at the Madison Square Garden Show will be that of the Lee Tire & Rubber Co., Conshohocken, Pa. They will show their celebrated puncture proof pneumatic tire, which has averaged over 6,000 miles under hardest truck service without a single puncture or inner tube replacement. This is a widely advertised tire and the beauty of it is that the manufacturers back up their advertising with merit. Be sure and visit the exhibit of this company at space 253 Balcony, Madison Square Garden Show.

Inflates Tires in a Jiffy.—We can sincerely recommend to our readers the Stapley Tire Pump. This is a very powerful pump and the car owner who includes this handy tool in his equipment will dispense with back-ache, blistered fingers, and all the hard work of pumping up tires. The construction of this pump is the very best. It has seamless brass tube cylinders which cannot rust and a heavy cast base built to withstand the roughest service. There are no complicated parts and it is practically impossible for it to get out of order. If you try one of these pumps you will never wish to do without it. The price of the pump with tire gauge is \$6, and without the gauge \$4. If your dealer does not keep the Stanley pump, write the Bridgeport Brass Co., P. O. Station D, Bridgeport, Conn., and mention this magazine. The manufacturers will also be glad to send interesting literature containing complete information.

The Shaler Vulcanizer.—These vulcanizers are sold by automobile supply houses throughout the country and have established an enviable reputation for reliability wherever they have been introduced. They are made by the C. A. Shaler Co., 811 4th street, Waupun, Wis. But consult the full page announcement of this company on another page and write for their hand book entitled "Care and Repair of Tires," which will be sent free to every reader and it is well worth sending for.

"Leak-Proof" Piston Rings.—These are made by McQuay-Norris Manufacturing Co., 1313 Chestnut Street, St. Louis, Mo. See their announcement on another page. "Leak-Proof" rings are not the cheapest on the market but cheap things are not always the best to buy as nearly every reader has had a chance to find out and above all things nobody wants a piston ring that does not do its work properly. "Leak-Proof" piston rings increase power; decrease carbonizing; save fuel and save money. Write to the manufacturers as above for further particulars and prices mentioning the Automobile Dealer and Repairer.

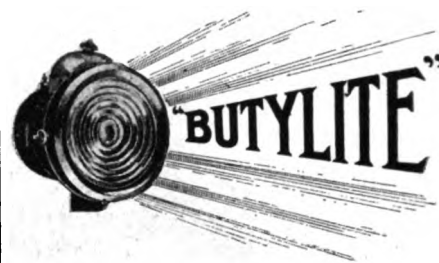
Air on Tap.—Dealers and repair men by using the Curtis Common Sense garage air pump illustrated and described in our advertising columns can furnish air on tap to their patrons. The garage or repair man who installs one of the Curtis pumps will have a distinct advantage over his competitors. A motorist will go out of his way to patronize a repair man who can furnish air on tap for his tires satisfactorily. But write for full details and prices to the Curtis & Co. Mfg. Company, 1530 Kienlen Avenue, St. Louis, Mo.

A New Automobile Headlight.

The latest automobile headlight and one which will be warmly welcomed is the Butylite lamp. It has many features that will appeal to those who drive much at night and wish to be independent of the usual sources of supply. The Butylite lamp employs alcohol as a fuel, and is entirely self-contained. At the present time, denatured alcohol can be readily obtained even in small country stores, and is comparatively inexpensive. In case of necessity, the ability to use grain alcohol in these lamps makes it possible for the motorist to obtain a supply of fuel at any drug store. The alcohol reservoir is made as a part of the lamp itself. This will be appreciated by those who have

been obliged to change tires at night, or make repairs under or about their cars. By removing one Butylite lamp from its brackets on the car, it can be set on the ground at any convenient angle, and its strong, brilliant light directed where needed. Furthermore, it can also be carried in the hands in any case necessitating the motorist seeking assistance and being required to go on foot.

It goes without saying that no separate tank is needed and piping from the fuel supply to the lamps is eliminated, and all trouble with these connections is done away with. The source of light is a specially constructed mantel of double



weave, and has been proved so strong as to be practically unaffected by the roughest roads and the severest vibrations. The mantel is heated to a brilliant white by alcohol vapor and air combined, the intensity of the light being controlled by a needle valve passing through the hood. Extra mantels are supplied with the lamps. The life of each mantle should be at least 3 months. The spread of the beam has been made so as to light the road not only well in advance of the car but so as to include sufficient illumination on either side as to insure safety while operating at night. The throw is about 600 feet with a 250 feet spread lighting both corners when turning. The method of operating the lamp is simple and safe. One filling requires a little over a quart of alcohol, which will burn about 20 hours. Denatured alcohol can be bought by the gallon for 65 cents, so that for this amount two Butylite lamps would be supplied with fuel for about 40 hours continuous burning, or one lamp nearly 80 hours. This represents an expenditure of less than one cent per hour for each lamp. The workmanship is the very best that can be obtained, while only such materials as have been proven entirely suitable in high class lamp construction are employed.

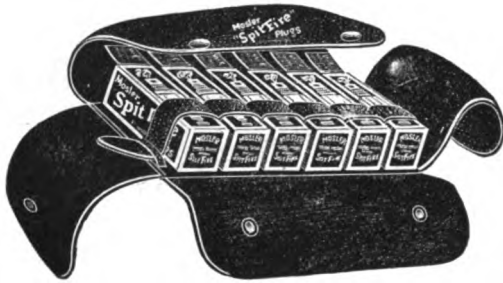
Good agents and dealers throughout the country are wanted for the Butylite lamps, and correspondence is invited. Inquiries should be addressed to Butylite, Department A, 32 Union Square East, New York City, with mention of this magazine.

Mineter with Rayfield.—N. H. Mineter, who for several years has been sales manager of the Stromberg Motor Devices Co., has resigned his position with that concern and is now associated with the Findeisen & Kropf Mfg. Co., of Chicago, as factory sales manager.

Best Traction Chains.—These chains are described by the manufacturers in the phrase "The chain that lasts" and if you will correspond with H. E. McLain & Co., 162 Pond street, Natick, Mass., they will be only too glad to furnish you with full information. This publication should be mentioned in all correspondence with them.

Making a Christmas Present to Everybody.

A. R. Mosler & Co., make a very liberal offer in this issue. They will give away free a handsome genuine leather Split Fire Spark Plug Case. This case holds six Mosler Platinum Pointed Spit Fire plugs in their individual cartons. The case is made of a fine quality durable leather finished in black with as much care as a high priced pocketbook. The sliding holding strap is so arranged that the plugs can be kept in their original packages, or it is adjustable to hold the plugs unboxed if desired. This handsome case affords the proper protection for the extra spark plugs which every careful driver carries with him.



Spit Fire Spark Plug Case. Christmas Present to Car Owners from A. R. Mosler & Co.

It keeps the plug clean, prevents rusting and protects the sparking points, which are so easily put out of adjustment. The double flaps fasten with solid ball and socket snap buttons, completing a case such as you could give to your best friend as a present, or be glad to receive yourself. A. R. Mosler & Co. are giving this case free of charge with every order for six platinum pointed Spit Fire plugs, six $\frac{1}{2}$ in., Metric or $\frac{7}{8}$ -18 platinum pointed Spit Fire plugs, at the regular price of \$1.25 each for the $\frac{1}{2}$ in. or Metric and of \$1.50 for the $\frac{7}{8}$ -18 plugs.

Each and every one of these platinum pointed Spit Fire plugs bears a red tag guaranteeing the point to be genuine iridium platinum which will last forever. The Spit Fire construction combined with platinum points assures energetic ignition and greater power from your motor.

As this offer only extends from the first day of December until after the New York Show, we advise our readers to take advantage of this Christmas present now. In all correspondence address A. R. Mosler & Co., P. O. Box, "M," Mt. Vernon, N. Y., and mention this magazine.

Have a set of Genuine Iridium Platinum Pointed Spit Fire plugs with you and keep them in this leather case.

Patent Luxury Folding Seats.—These seats are well described by the manufacturers in the phrase "The Seats that Satisfy." Many automobile manufacturers and car owners regard these seats as a necessity of high grade car equipment. They are made from steel drop forgings, are artistic in design and finish, and are warranted to be as durable as they are compact and convenient. Interested readers are urged to write for free catalogue to Hodge & Graves Co., Amesbury, Mass., and in writing mention this magazine.

Vulcan Inner Tubes, Casings, Reliners, etc.—The Vulcan Rubber Company, of Erie, Pa., makes a specialty of Inner Tubes, Inner Casings, Reliners, Blow-out Patches, Tire Pads, etc. Their Inner Tubes, they tell us, are made of

"long" gummy stock and will not crack or become brittle. Their Inner Casings completely envelop the inner tube. They add strength to a casing and will keep one in service which without such casing would have to be thrown away. The Tire Reliners, Blow-out Patches, Tire Pads, etc., are made in several grades. Full value is said to be given in every case. Their prices are reasonable and they promise prompt shipments on receipt of orders. Write at once for their descriptive circular giving further particulars and prices and mention the Automobile Dealer and Repairer.

Valentine's Vanadium Chassis Finishing.—It is said that "the proof of the

pudding is in the eating" and it is certainly true that any article which has been submitted to a scientific test and comes out victorious is entitled to great credit. In the full page announcement which appears this month for Valentine & Company, they describe and illustrate an actual test in which an automobile wheel was finished on half the spokes with a well-known gear varnish and on the other spokes with Valentine's Vanadium Chassis Finishing. The wheel was revolved for several hours in soapy water and the surprising result was that the ordinary gear varnish turned grayish and was practically destroyed, while Valentine's Vanadium Chassis Finishing was absolutely unharmed and retained all its original brilliant lustre. Readers are urged to send for a free sample of this article and no one who visits the New York Show should fail to visit the booth of Valentine & Company, where there will be a demonstration of a very interesting nature.

A Complete Line of Vulcanizing Equipment.—We refer readers who are interested in vulcanizing tires to a full page advertisement, which appears in this issue, of the Auto-Tire Vulcanizing Company, of Lowell, Mass. This company makes everything conceivable for the tire repair shop, including their new No. 8 adjustable sectional vulcanizer with three cavities, also tube vulcanizer, retreading kettles, retreading coils, inside vulcanizers and a line of other vulcanizing specialties too numerous to mention. Every repair man or garage owner in the United States who does vulcanizing should get in touch with this company. They have some interesting information which will put you in the way of making big profits if you will just take the trouble to write them and mention this magazine. This is important to the tire repair man. Write at once and be sure and mention the Automobile Dealer and Repairer.

Information on Lubrication for Dealers.—Nearly every dealer and garage owner realizes the importance of correct lubrication and it is an advantage to any

dealer to have information on this point in handy accessible form. The Vacuum Oil Co., of Rochester, N. Y., has issued a complete chart which shows the correct grade of Gargoyle Mobiloils for 111 makes of cars. The complete chart covers 400 cars and is supplied in durable hanger form to dealers who supply the Gargoyle Mobiloils. A portion of this chart is printed this month in the full page announcement of this company, and not only dealers but car owners will be much interested in this information. The Vacuum Oil Co. has distributing warehouses in the principal cities of the world, and their product is too well and favorably known to need further praise in our columns. The Gargoyle Mobiloils are handled by the higher class garages and automobile supply stores throughout the country. Complete particulars concerning these lubricants will be sent to any reader who will write to the main office at Rochester, New York, and mention this magazine.

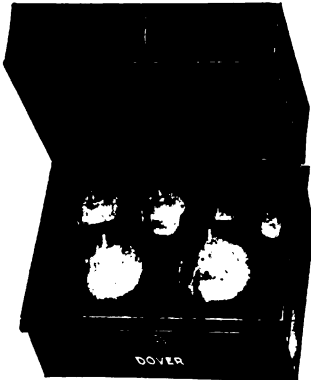
Genuine Supplementary Spiral Springs.—It is particularly suggested by the manufacturers of the genuine supplementary spiral springs that the most luxuriously upholstered and best tired car cannot give comfort to its occupants unless it has proper spring suspension. The application of the St. Louis Supplementary Spiral Springs to the car is one logical solution of the spring problem. Their use means increased speed, more comfort, greater economy and added safety. Send for catalog stating the make, model and year of your car to the St. Louis Supplementary Spiral Spring Co., 1779 Broadway, New York City.

The Brennan Motor.—This is a high grade, moderate priced motor, which many of our readers have already purchased for replacement purposes as it often happens that a car owner wishes to put in a more efficient power plant in his car. The Brennan motor is backed up with twelve years' experience. It has large bearings, large valves and long stroke. The Model B, which is illustrated in our advertising columns this month, has demonstrated its ability to give perfect results in touring cars, commercial cars, tractors, ploughs, etc., and is guaranteed to give satisfactory results. Readers are requested to write for blue prints, catalogue, and full information to The Brennan Motor Co., Syracuse, N. Y. and mention this magazine.

Make Your Old Tires as Good as New.—The Triple Tread Mfg. Company, 1542 Michigan Avenue, Chicago, Ill., with branches in San Francisco and Winnipeg, has an attractive announcement in this issue showing how an old tire may be built up so as to give many miles of extra service. But consult the advertisement of this company on another page and write to the nearest factory mentioned, for full particulars and prices.

The Perfection Rim Remover.—We understand this device is giving excellent satisfaction wherever it has been introduced. It is simple in construction and easily worked. It is said to be an indispensable tool. One of their customers writes concerning this rim remover as follows: "The one you sent me some time ago works to perfection." It will be found illustrated and briefly described in our Advertising Department. Dealers should write for special terms. Address Perfection Manufacturing Co., New Martinsville, W. Va.,

Dover Specialties.—The Dover Stamping & Mfg. Co. of Cambridge, Mass., has this year brought out several new automobile specialties which are illustrated herewith. One of these is the



Dover Electric Light Bulb Case.

Dover "Saval" Combination Measure and Funnel which can best be understood by inspecting the accompanying illustration. It positively prevents overflowing the oil tank and spilling oil over the engine and other parts which is al-



Dover "Saval" Combination Measure and Funnel.

ways the case with the ordinary oil measures. This article will easily save its cost in a single season. We also illustrate the new Dover Soap Economizer which is described as a "perfect pail for washing cars" as it will reduce soap con-



Dover Soap Economizer.

sumption at least one-third. This pail was invented by a practical garage man and has been tested successfully in several of the largest garages. The cut gives an excellent idea of its construction. Still another new article which

has been brought out by this company is the New Dover Electric Light Bulb Case which we also illustrate. This gives allowance for any assortment of bulbs to suit the user. Every automobilist using electric lights must carry extra bulbs and will want one of these cases for convenience and protection of the lamps. Readers who are interested in any of the articles mentioned should address the Dover Stamping & Mfg. Co., Cambridge, Mass., and mention this magazine.

A New Vulcanizer.—The Dayton Inner Tire and Rubber Co. of Dayton, Ohio, offer to car owners a new vulcanizer, which has many valuable practical features. For further details our readers are referred to the attractive full page announcement which appears on another page of this issue. In any correspondence with this company, kindly mention The Automobile Dealer and Repairer.

Gilmer Tire Repair Pliers.—This handy tool is almost indispensable to any man who does any repairs on his own tires. The Gilmer pliers certainly fill a long felt want. You can wear white gloves while using them with no danger of soiling. It makes it possible to repair the tire much more quickly than by the old methods. For using these pliers the cut in the tire may be distended for cleaning and applying the gum. A ratchet in the handle holds the pliers open. The price of a nickel plated pair of pliers, with combination cleaner and cotter pin hook is \$1.00. Write to G. Walker Gilmer, Jr., Filbert and Seventh streets, Philadelphia, Pa., for advance copy of Show Announcement, also for a copy of "Tire Insurance." Mr. Gilmer will have an exhibit in the Garden Show, space 639, and undoubtedly many of our readers will be interested to see how the pliers are used by visiting this space.

The Ford Hood Cover.—The special attention of the Ford car owners is called to the new Ford Hood Cover, which is a winter specialty for Ford cars recently brought out by the Auto Parts Co. of Providence, R. I. This cover is made from rubber cloth, well stitched and padded with felt. It completely envelops the hood and radiator and keeps in the heat, working on the same principle as a "fireless cooker" or a "vacuum bottle." It is absolutely waterproof and can be left on the hood all winter, protecting the engine from rain and sleet as well as the cold. The retail price on this excellent article is only \$6.00, prepaid, on receipt of price. Readers should also write for the new 1913 free catalog of the Auto Parts Co., Providence, R. I., in which they will find illustrated 40 useful specialties for Ford car owners. In writing mention this magazine.

The Avon Patch.—This is manufactured by the Gray Specialty Co., of Newark, N. J., who state that this tire patch is "built like a bridge." In our columns this month they make an attractive introductory offer to familiarize the public with the new blow-out patch. With each Avon patch bought by our readers, they will send absolutely free, any one of the following articles, one can of clutch compound, one rubber putty outfit, one box cementless patches, one pint rubber cement, one and a half pints aluminum paint, and one pair of rubber goggles. These articles are worth 50 to 75 cents each and the offer

is certainly an unusually generous one. The patches cost according to size from \$1 each up to \$2, and we refer our readers to the complete price list which is published by this company in their announcement on another page. To enjoy the full benefit of this remarkable offer, it is necessary for the reader when writing the Gray Specialty Co., to mention this magazine. Good dealers are wanted to make this offer to their customers.

Non-Fluid Oil at the Show.—In the New York & New Jersey Lubricant Co., we have one of the pioneer exhibitors at the Motor Shows. Non-Fluid Oil, which was one of the first lubricants to come into popular favor with motorists, will, as usual, be displayed in a most attractive manner in a large transmission gear case and differential. It might be said in passing that Non-Fluid Oil was the first lubricant to be demonstrated in this manner and that this convincing proof of the quality of the lubricant is being placed before motorists in gear case displays all over the country. The New York & New Jersey Lubricant Co. will exhibit also a most unique device to display the various grades of their cylinder oil, MoToRoL. A new package called KeJeX, which has appealed strongly to motorists, will be exhibited with the various grades of Non-Fluid Oil. The KeJeX package is designed to serve the purpose of a lubricant gun without transferring the lubricant from the original package.

The New York & New Jersey Lubricant Co. has always made it a policy to extend all the courtesies possible to visitors from out of town and members of the Sales Department who are known throughout the trade are always on hand to discuss the "situation" and to devote all the time there is to the distribution problems, which may confront their out-of-town constituents.

Mayo Spark Plug Tire Pump.—You simply remove a spark plug from any convenient cylinder and substitute the pump. After connecting the hose from the pump to the tire, the motor should be started and run on low throttle from two to four minutes until the tire has been inflated to the pressure desired. But for full details, write to the Mayo Mfg. Co., 55 E. 18th street, Chicago, Ill. See advertisement.

Beware of Spurious Magneto and Coil Parts.—The Remy Electric Co. of Anderson Ind., in its full page announcement in this issue warns our readers to beware of spurious magneto and coil parts and to note that they have suits pending against several parties for infringement. But consult the advertisement of this company on another page.

Guide Electric Head Lights.—These are made by the Guide Motor Lamp Mfg. Co., 2069 E. 4th street, Cleveland, Ohio. With these head lights night driving becomes a pleasure. Send for Guide Book No. 6, which gives full particulars. These lamps will be demonstrated at the Madison Square Automobile Show at the booth of Chas. E. Miller and our readers are invited to call and see them.

Belt and Motor Drive Air Compressors.—These are manufactured by R. Spicer & Co., Groton, Conn. These compressors supply air for inflating tires, cleaning machines, operating tools, conveying oil or gasoline under pressure. Every garage owner or repair man should be interested. Write for circulars and prices.

The Russell Tire Case.

This is manufactured by Hopewell Bros. of Newton, Mass. Automobilists long ago discovered that there are difficulties of fit in connection with most of the tire cases on the market. These difficulties are fully overcome in this new type of case. It is a tire case overlapping on the bead. The bead of the case is held snugly against the tire by



means of a flat, flexible, expanding spring, which is sewn on a pocket fold at the edge of the case. To adjust this case to any tire it is simply necessary to wrap the case about the tire and to hook the clasps on one bead into the pocket-fold on the other bead edge. The tire may be fitted to the case almost instantaneously and it is neat in appearance as shown in accompanying cut. The retail prices of this case in black enamel cloth, in all sizes up to 37 inches, is \$2.50, and for demountable rims, or sizes larger than 37 inches, the price is \$3.00. If this case is not carried in stock by your dealer, the manufacturers will be pleased to fill orders direct, and they would also like to send to our readers a catalogue of their many other specialties for automobiles. In writing them address Hopewell Brothers, Newton, Mass., and mention this journal.

The Rhineland Machine Works Company, 140 West 42d Street, New York City, keep in stock ball bearings for every European and American car. If you are interested, write for particulars and prices.

For "J.M." Shock Absorbers.—The "J.M." Shock Absorber Company, 219 South 17th Street, Philadelphia, Pa., have an announcement in this issue of the "J.M." shock absorber for Ford cars. This shock absorber will give, it is stated, a riding comfort never before possible. By holding the rear wheels to the ground they insure continuous traction and cut down wear and tear on tires and car. Write for booklet "V" which gives full particulars.

Hoyt Ammeters and Voltmeters.—These electrical testing instruments are well-known wherever automobiles are used and the best evidence of their merit lies in the fact that since 1904, when they were first manufactured, there has been a remarkable growth in the floor space occupied by the factory in New Hampshire where these instruments are produced. In 1904 336 square feet of floor space were occupied, representing an investment of less than \$5,000. There has been a steady and constant growth, until today 27,400 square feet of space is occupied, and an investment of over \$100,000 is involved in the business. An interesting catalogue is issued which

should be in the hands of everyone of our readers. In writing for this catalogue, address Hoyt Electrical Works, Penacook, N. H., and mention this magazine.

"F-S" Evernew Auto-Top Dressing.—The manufacturers of this meritorious article state that auto-tops can be made waterproof and weatherproof by its use, and at the same time renewed in appearance. This dressing is absolutely non-injurious, dries quickly, and is easily applied. You do not need to be an expert painter to renovate your automobile top with this dressing. The dressing comes in eight standard colors, and special shades are made to order. Readers are urged to write for full color card and prices to the manufacturers, Felton, Sibley & Co., 136-140 N. Fourth St., Philadelphia, Pa. The same firm also manufactures "Evernew" Auto-Top Sizing for the first coat on mohair, cloth or canvas tops that have never been painted, also "Evernew" Auto-Body Enamel in colors to correspond with the Evernew Auto-Top Dressing. Thousands of car owners who have used these preparations will testify to their merits, and they are produced by a firm which has had more than a century of experience in the manufacture of paints, colors, varnishes and enamels.

A Handy Trouble, Inspection and Garage Lamp.

We illustrate herewith an exceedingly handy little article which should be in every public and private garage. It is a trouble inspection and garage lamp



Trouble, Inspection and Garage Lamp, Style 31. Manufactured by Frank W. Morse, Boston, Mass.

which can be used in any position, under the car, or anywhere around the car. A long connection wire and plug is provided and this lamp can be connected with the regular lighting system in a moment. It comes packed in a neat plush case, as shown in the accompanying cut, and this case can be slipped easily into a small coat pocket, or even a vest pocket. This lamp is known as style No. 31 and it is manufactured by Frank W. Morse, Boston, Mass. Dealers or car owners who are interested should communicate direct with the manufacturers and mention this journal.

For Automobile Repairs.—A large line and a full stock of automobile forgings

and trimmings for the repair trade is constantly carried by the reliable firm of John A. Gifford & Sons, 25 Park Place and 22 Murray St., New York City. This is one of the oldest vehicle supply houses in the city and their reputation for responsibility is the best. They will issue a new catalogue about January 1, 1913, and interested readers are requested to send for same, which will be mailed free of charge if you mention this publication.

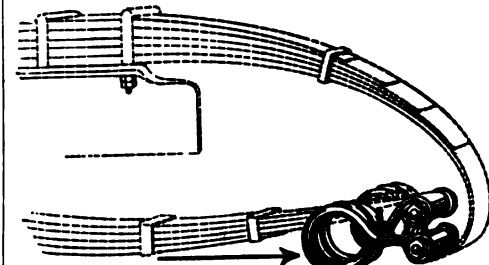
The "Davis" Milling Attachment.—The Hinckley Machine Works of Hinckley, Ill., manufacture the "Davis" Milling Attachment and Compound Table which can be attached to any upright drill press of any size from 14 inches to 42 inches swing, in two minutes time. It is a tool which every repair man can use in his shop to advantage. Write at once for full descriptive circular and prices to the above address and mention The Automobile Dealer and Repairer.

Ride on Air.—This phrase heads the attractive booklet recently brought out by the Sealo Tire Co., 1411 Michigan Ave., Chicago, Ill. The manufacturers say that "Sealo" is not a cure all. They have worked for a means to overcome punctures, the one great cause of most tire troubles. They furnish a written guarantee with every package of Sealo, but write them for their leaflet which contains some interesting information and testimonials and is well worth sending for.

Reduction In Price.—We understand that the Kearns Motor Car Company, of Beavertown, Pa., has reduced the price of its trucks from \$1225 to \$975 and gives buyers the choice of motors, namely—3 cylinder two cycle air cooled with magneto, or, 4 cylinder four cycle water cooled with magneto. Further particulars may be obtained by writing to the manufacturers as above.

Acme Torsion Springs.

The manufacturers state that a car equipped with these springs does not jounce or bounce. The manufacturers make the claim that these springs, although much less expensive, serve the same purpose as the regular shock absorber. It is said they stop vibration, prevent spring crystallization and breakage, minimizing tire and engine



The Acme Torsion Spring.

trouble, and improve the riding qualities of any car at least 75 per cent. They are adaptable to all types of leaf springs and are quickly and easily applied by any one. The manufacturers are anxious to convince you as to the quality of their product, and readers are urged to write today for information and prices to the Acme Torsion Spring Co., 980 Boylston Street, Boston, Mass. In all correspondence mention this magazine.

Multibestos Brake Lining.—The safety of passengers in any automobile is very largely dependent upon a good brake: and the principal feature which makes a brake effective is the brake-lining. The Multibestos Brake Lining has been sub-

jected to rigid scientific tests and in comparison with many other competitive articles, it has made a remarkable record. Readers who may be interested should consult the full page advertisement which appears in this issue, and send for an interesting free book entitled "Safe Within the Grip of Multibestos." Address all correspondence to the Standard Woven Fabric Co., Worcester, Mass. Orders may be placed with the various selling agents of this company who are enumerated in their advertisement.

100 Per Cent. Dividend in 90 Days.—The Imperial Fluid Gauge Company, of 334 E. 8th Street, Canton, Ohio, manufactures the Imperial Gauge, which is designed to give the correct capacity of gas tanks. It will detect leaks. With it you can tell when your carburetor is flooding and wasting fuel. When purchasing gasoline it will measure it accurately. With this gauge you don't have to measure your gasoline with a stick and with it you can get the greatest maximum mileage per gallon. But read the advertisement of the company on another page and write for descriptive circular and prices. Dealers are invited to send for special terms as the company wants agents everywhere to sell its goods.

Lubro Anti-Freeze Fluid.—Every owner of an automobile should be interested in the full page announcement in this issue of the Lubro Oil Company, 116 Prospect Street, Cleveland, Ohio. Their Lubro Anti-Freeze Fluid, is guaranteed not to freeze and they say it is better adapted for cooling purposes than water itself. Dealers generally are supposed to sell it, but if yours does not have it the company will ship you a gallon for \$1.50. Dealers are requested to write at once for Special Service Station Offer. Dealers should be in a position to sell large quantities of this fluid.

The "Peerless" Automatic Tire Vulcanizer.—The Leader Mfg. Company, 3049 W. 25th Street, Cleveland, Ohio, has an advertisement in this issue descriptive of the "Peerless" Automatic Tire Vulcanizer. It is a very complete and compact device and is absolutely automatic in its operation, so the manufacturers say. They say it covers a space about nine inches square and will vulcanize a patch on casing or inner tubes that will stay on. It is sweated right in to the rubber and becomes a solid part of the tire or tube. This vulcanizer the manufacturers say is made strictly for business. It has a specially constructed burner that is adapted to burn either gasoline or denatured alcohol with perfect combustion. The complete outfit with enough repair material to make from 30 to 50 patches will be sent to any part of the United States charges prepaid for \$1.50. Write to the company as above.

The Secret of Long Life.—Everyone is interested in the secret of long life, and every motorist who is obliged to buy tires is interested in the long life of his tires. The K & W reliners will make the weakest point in your old tires stronger than a new tire according to the claims of the manufacturers and they also prevent deterioration by age and road travel. The K & W reliners are fully covered by patents and have some features not found in any other reliner on the market. A very large line of other tire accessories is manufactured by the K & W Manufacturing Co., whose factory is located at Ashland, Ohio, and

every one of our readers should send for their interesting free catalogue. In writing them mention this magazine.

Gray & Davis Products at the Show.—At the New York Auto Show Gray & Davis of Boston will show the Gray & Davis Dynamo and lighting system and the celebrated Gray & Davis 6 Volt Electric Starter, which will undoubtedly attract much attention.

Nathan's Presto Tire Cover.

This is a buttoned tire cover made of a fine quality of enameled goods. It is manufactured by the Nathan Novelty Mfg. Company, 88 Reade Street, New York City, and is cut on the same pattern as the celebrated Keystone Tire Cover manufactured by the same firm. The neat appearance of this tire cover can hardly be appreciated by an inspection of the cut. This cover is guaranteed to fit perfectly. It is fastened with a few snap buttons. It is guaranteed to meet



The Nathan "Presto" Buttoned Tire Cover Manufactured by Nathan Novelty Mfg. Co., 88 Reade Street, New York City.

every requirement where a serviceable tire cover is needed and at the same time its appearance is sufficiently smart and attractive to please the most fastidious car owner. In spite of its high quality this tire cover is being put on the market at the extremely low retail price of \$1.75. If your dealer cannot supply you write to the manufacturers and mention this publication.

Champion Priming Plugs.—These are designed especially to end all winter starting troubles. The trouble in starting a car is likely to be greater this winter than ever before because the gasoline in use is of lower test. These priming plugs are especially useful on cars that have no priming cups, and the manufacturers state that they are also needed on cars that have priming cups because the cups cannot deliver the gasoline directly to the firing points. The Champion Priming Plugs deliver the few drops required, just where they are needed. Readers who are interested in a more complete technical description of these plugs, should refer to the attractive full-page advertisement which appears in this issue. Even fuller particulars, together with trade discounts, etc., will be furnished if you will take the trouble to write the Champion Spark Plug Co., 112 Upton Ave., Toledo, Ohio. Perhaps it should be stated that the regular retail price of the Champion Priming Plug is \$1.25. In all correspondence with the manufacturers, kindly mention this publication.

Rex Nickel Polish.—Few readers will fail to observe the striking full-page advertisement in this issue of the Armiger

Chemical Company, 2150-52 Austin Avenue, Chicago, Ill., describing briefly their Rex products. There is the Rex Metal Cream, Rex Nickel Polish, Rex Wood Oil and the Rex Leather Dressing. The latter is designed for the finish of tops of automobiles, carriages, etc. All these preparations are guaranteed by the manufacturers to be first-class in every particular and are for sale by dealers in automobile supplies throughout the country. If you cannot procure them from your dealer, write direct to the company at the address given above.

Our Southern subscribers will perhaps be glad to know that the H. W. Johns-Manville Co. have opened a new Southern warehouse at 32½ South Broad St., Atlanta, Ga., where the automobile supplies manufactured by this company and advertised in each issue can be obtained.

The Simplicity Rectifier.—In this issue, the Wilson Supply Company, 1191 Gladys Avenue, Cleveland, Ohio, have an announcement of their Simplicity Rectifiers, which are substitutes for costly dynamos. The idea of this rectifier is the charging of lighting and ignition batteries at one's own home from an alternating current at an extremely low cost. There are no moving parts or glare of light, and it does the work right, so the manufacturers say, and adds at least one-third to the ordinary life of the best battery made. Write for booklet giving full particulars and prices.

The Universal Auto Turntable.—This Turntable has several advantages which ought to recommend it for use in many public or private garages. The manufacturers call special attention to what they term the "Serpentine" Ball Bearing Race Course and the claim is made that this construction has reduced friction over fifty per cent. Nearly all automobile turntables require a pit twelve inches in depth; but the Universal turntable can be placed on upper floors without the slightest inconvenience. This turntable is made in four sizes, adaptable to every use and every car. Readers are requested to send to the Canton Foundry and Machine Company, Canton, Ohio, for their catalogue "C-1." The same company manufactures an Auto-Jack and Emergency Truck which many garage owners and repairmen have described as "the handiest tool in the shop." In writing for literature mention the Automobile Dealer and Repairer.

All-In-One Spark Plug.—This is described as a powerful, sootless and durable plug which fits any engine and gives perfect ignition. A priming cup is combined with this plug so that you prime your motor instantly, an important feature in winter starting. To clean the contact points you simply pour gasoline into the priming cup and the carbon deposit is blown out into the air at each discharge of the motor. This plug retails for only \$1.50 and is highly recommended by all who have tried it. The manufacturers announce that they will prosecute vigorously all infringements which may be on the market, or that may spring up in the future. For prices and particulars concerning the genuine All-In-One Plug address Frontier Specialty Co., 732 Main St., Buffalo, N. Y., and mention this periodical.

Edelman Specialties.—These comprise the Edelman Tire Gauge, the Economy Tire Gauge, No. 41 Ford Crank Case Oil Gauge, Automatic Air Chuck, Grease Cups, etc. See their advertisement on another page and in ordering mention the Automobile Dealer and Repairer.

The Feps Carburetor.—This new carburetor is said to be an entire innovation and the manufacturers describe it as "A Giant in Power—A Miser in Fuel." It is claimed that this carburetor, when attached to any car, will add from twenty-five to sixty per cent. to the mileage and the manufacturers would be glad to have you give them an opportunity to substantiate this claim. Write to the Schoen-Jackson Company, Media, Pa., for complete particulars and mention this publication.

The Abell Ball Bearing Tire Pump.—This is a three cylinder tire pump attachable to your car, and the manufacturers state that it is of greater capacity than any other pump of the kind made. It is light, compact, fast, durable and every revolving part has a ball bearing. When this pump is used no oil can get into the tires. The same pump may be driven by an electric motor for garage use, by simply attaching to an ordinary electric light socket. An interesting free catalogue will be sent to any of our readers on request and all inquiries should be addressed to the Standard Thermometer Co., 65 Shirley Street, Boston, Mass. Inquirers are requested to mention this magazine.

Worko.—This is what the manufacturers call a gas engine tonic with laxative qualities for sick, weak motors that knock, overheat and dirty your spark plugs unusually fast, but consult the advertisement of the Worko Company, 130-35 Winslow St., Racine, Wisconsin, for further particulars and price. Dealers are requested to write at once for special proposition.

J. & B. Ignition and Lighting Specialties.—Owners of Ford cars who have not investigated should get particulars concerning the J. & B. master vibrator, light controller and light regulator. All of these articles are especially adapted for Ford cars and they are used by delighted Ford owners throughout the United States. Satisfaction is guaranteed or money refunded. Just drop a postal for particulars to the J. & B. Manufacturing Sales Co., 1777 Broadway, New York. Your inquiries will have prompt attention if you mention this magazine.

Shock Absorbers on Trial Free.—The manufacturers of the celebrated Sager shock absorbers are making a particularly liberal offer to car owners, throughout the United States. To any interested owner they will send a set of these shock absorbers on sixty days' free trial, and if the owner is not satisfied with results they will refund the money. Certainly nothing could be fairer and more liberal than this. Sager shock absorbers have been adopted as regular equipment on Saurer-Stewart, Kissel Kar, Lippard-Stewart and Franklin trucks, and they have been warmly endorsed by the following prominent automobile manufacturers: Oldsmobile, Elmore, Pierce-Arrow, Crawford, Dorris, Rambler, Maxwell, Stoddard-Dayton, Logan, Pope-Hartford, and quite a list of other companies. The manufacturers of these shock absorbers also manufacture a popular bumper known as the Sager bumper. This has recently been adopted as standard equipment by the Cadillac and Packard Companies. People who are interested in good shock absorbers and good bumpers should get literature and full particulars from the J. H. Sager Co., 291 South Ave., Rochester, N. Y., and in all correspondence mention this publication.

Federal Grips for Solid Tires.—The Federal Chain & Mfg. Co. of Springfield, Mass., who recently acquired all rights to manufacture the Gaylor Grips, have also added the Federal Grips to their regular line. These are special grips for solid tires. They are made in units consisting of two steel cross-members integrally connected by two side arms, as shown in the illustration. These grips are so constructed that the gripping portion which crosses the face of the tire is double the thickness of the steel side arms, thus giving a very effective driving medium and at the same time avoiding unnecessary weight and thickness on the sides of the wheel. The under surface of all cross-members are rounded where they come in contact with the tire, so that they cannot injure the tire under any circumstances. These grips fold up in a very compact form when not in use, and can be conveniently carried on the car. They can be attached to the wheel in two minutes. It is only necessary to place them evenly on the wheel, bring the free ends together at the bottom and engage the lever fasteners on each side, and they are ready for use as shown in Fig. 1.

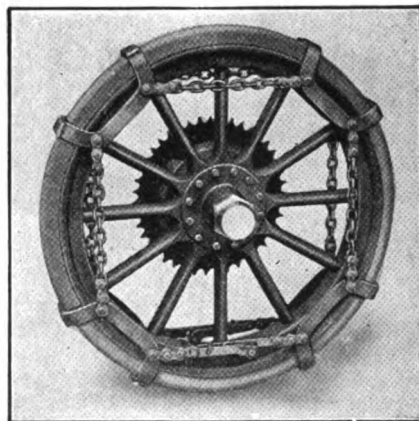


Fig. 1.

The Federal Grip. Manufactured by the Federal Chain and Mfg. Co., Springfield, Mass.

No tools are required but the hands to attach the Federal Grips and they can be applied in two minutes or less. As solid tires wear down to a much greater extent than pneumatic tires, the Connecting Chains of Taylor and Federal Grips are made adjustable for the greatest change in tire diameter due to wear. Correspondence with the manufacturers is invited and in writing this magazine should be mentioned.

Interlock Inner Tire.—This tire, it is said by the manufacturers, The Double Fabric Tire Company, 18 West 9th street, Auburn, Ind., will double ordinary mileage. It will prevent blow-outs and punctures and it is said to save half of the tire expense. If you are skeptical about these statements the manufacturers would like to send you their booklet giving data, testimonials, etc., of a convincing nature. These Interlock Inner Tires are sold by dealers everywhere. If your dealer does not have them write direct to the company as above.

\$40,000,000 for Tire Repairs.—Repairmen should consult the advertisement in this issue of the Williams Foundry and Machine Co., Glendale avenue, Akron, Ohio, and write for full particulars about the Akron-Williams outfit which

has been recommended by 27 out of 30 tire makers and by successful repairmen everywhere. This company has outfits costing all the way from \$40 to \$1,000, depending upon the range of work to be handled. Don't fail to mention that you want catalogue No. 121.

The Flentje Recoil Preventer.—This is an automatic hydraulic device for the purpose indicated by its name, and the manufacturers are so confident that this appliance will give satisfaction that they are willing to put it out on thirty days' trial. The Simplex automobiles of New York are equipped with this recoil preventer, and the device is giving great satisfaction to the owners of Simplex cars. For full particulars, address Ernst Flentje, Cambridge, Mass., and mention this magazine.

Improved Velvet Shock Absorbing Springs.—All automobile springs are made strong enough to carry heavy loads with the result that when the automobile is carrying light loads, it must ride hard over rough roads. The Velvet Springs are resilient shackles or links

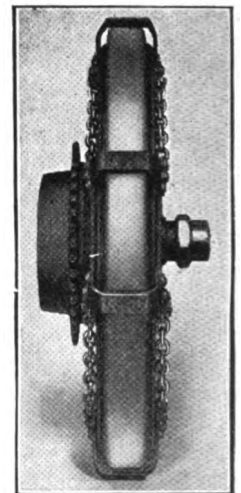
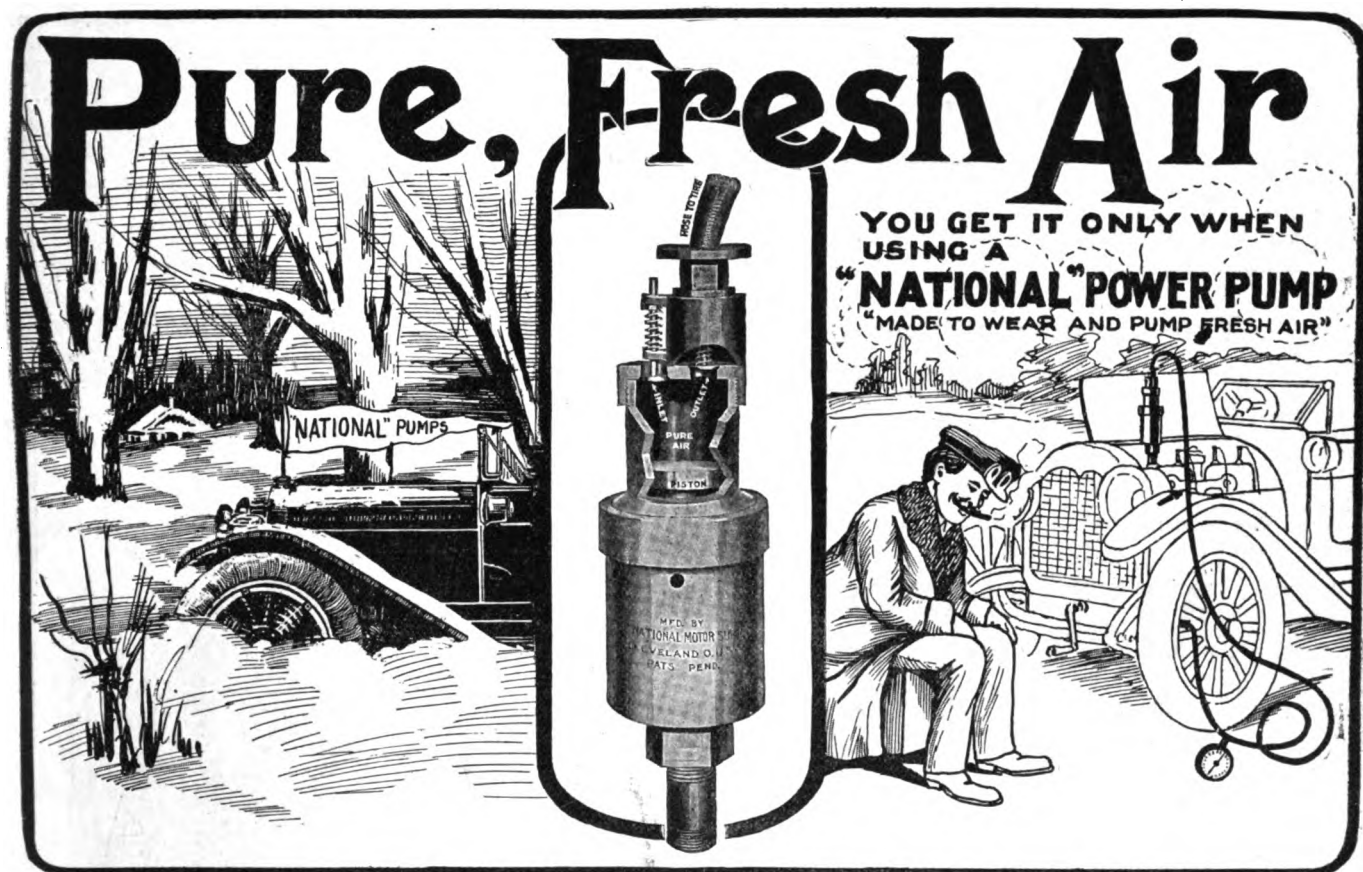


Fig. 2.

and compel the car to ride easy over the roughest roads or cobblestones. They say these springs will absorb all jolts, will lengthen the life of the main springs and save wear on the car and tires. They can be attached in a few minutes. Write for further particulars, giving name and weight of car to the John W. Blackledge Mfg. Co., 2210 Michigan avenue, Chicago, Ill. This company wants a few more agents in different parts of the country to sell these springs.

Splitdorf at the Show.—The Splitdorf Electrical Company will have many new appliances at the New York Show. They will exhibit four new magnetos of the low tension type, a new Splitdorf coil and a lighting generator, in addition to the well-known line of Splitdorf spark plugs.

Send Us Your Worn Out Annular Ball Bearings.—The Ahlberg Bearing Company, 1777 Broadway, New York City, and 2632 Michigan Avenue, Chicago, Ill., ask our readers in their advertisement in this issue to send them worn out annular Ball Bearings. They will regrind and make them as good as new. Consult the full page announcement of this company on another page and write for further particulars, mentioning the Automobile Dealer and Repairer.



LET YOUR ENGINE PUMP UP YOUR TIRES!

A "National" Power Pump will save you many tired backs, also dollars for new tires.

Isn't it true that you often look at your tires and say, "Guess they need more air, but I haven't time, or don't feel like blowing them up by hand—I will let them go for a few days yet." You also know, and every tire manufacturer will tell you, that you pay dearly by neglecting this work. Now, if you had a "National" Power Pump, your tires would always be fully inflated. All you have to do is take off a spark plug, attach the pump instantly, and start the engine. That's the extent of the work. But best of all, your tires will be filled with **absolutely pure, fresh air**, if you use a "National." Not a particle of cylinder gas goes through our pump. "It is made to wear and pump fresh air." We have spared no expense to make it the very best in every possible way. Patented "Leak-proof" metal piston rings are used. Every valve is carefully ground separately. Special connections to make it easy to attach. The entire outfit is highly polished and nickel plated. Twelve feet of woven cover tubing are furnished, in the center of which is a high-grade pressure gauge which shows the exact pressure all the time. In ordering state whether you desire connection to have half-inch standard, A. L. A. M. or Metric thread. Sold on trial. Write for information. Price complete, \$15.00.

VULCANIZERS

WE MANUFACTURE THE MOST COMPLETE LINE ON EARTH. We have them from \$3.50 up to \$40. Get our prices and special offer on sales. Be sure to state whether you want one for your own personal use or for public garage.

THE NATIONAL MOTOR SUPPLY CO.,
1920 EUCLID AVENUE, CLEVELAND, OHIO

We Will Exhibit at Madison Square Garden, New York, and Coliseum, Chicago, Auto Shows

Please mention the Automobile Dealer and Repairer when writing to advertisers.

A Personal Invitation to You

You are cordially invited to meet us at the New York Show during the week of January 11-18.

We will be at Booth No. 549.

We want you to do more than merely see

MILLER One Cure Wrapped Tread **TIRES**

We want to greet you personally—we want to get acquainted with you, Mr. Tire Dealer and Mr. Tire Buyer. You'll find us ready with the hand shake that is earnest and a smile that is genuine.

Then, after we're acquainted, you'll probably want to learn more about the greatest advance made in the construction of automobile tires in the last decade. That is the MILLER ONE CURE, WRAPPED TREAD method of building Tires. It is saving motorists thousands of dollars every day by the elimination of tire troubles due to old processes of manufacture.

And you'll also want to see the Miller Non-Skid Tire. Built with a new tread design that not only prevents skidding but also retains the non-skid feature twice as long as ordinary treads.

There are a few good towns in which we are not satisfactorily represented. Tire dealers who are looking ahead should write us for our agency proposition. It's interesting and profitable.

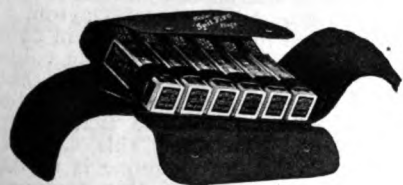
The Miller Rubber Co.

AKRON, OHIO



Mosler Spit Fire Plugs

SPECIAL HOLIDAY OFFER
ON MOSLER SPIT FIRE GENUINE IRIIDIUM
Platinum Pointed Plugs
OUTLAST ALL OTHERS—WORKMANSHIP & MATERIAL
GUARANTEED FOREVER



This Handsome Leather
SPARK PLUG CASE
Given Free to Every
Purchaser of Six of Our
**GENUINE PLATINUM
POINTED PLUGS**

Six $\frac{1}{2}$ in. or Metric Spit-Fire Platinum Pointed Plugs, \$7.50
Six $\frac{1}{4}$ -18 A. L. A. M. Spit-Fire Platinum Pointed Plugs, \$9.00

This special offer is limited to the holiday and show season. If you want one of these fine cases (cost at least \$1.50 retail) send your order to-day.

Mosler Spit-Fire Platinum Pointed Plugs are the finest plugs made.

They increase the power of the engine over 10% by actual test.

Give the hottest spark, even when batteries are low.

***If You Want Trouble Proof Ignition Use Nothing But
Genuine Mosler Spit-Fire Platinum Pointed Plugs***

Our patented base construction protects the porcelain and sparking points; it acts as a condenser of electricity and intensifies the spark; the deep base forms a compression chamber in which the gas ignites first, then shoots a heavy flame out into the cylinder, firing the charge with the greatest speed and power.

More Spit-Fire Plugs are used and sold to-day than any other make. We have produced ten million plugs and our present facilities are unlimited. No other maker has the experience, manufacturing equipment and patent rights combined to make as good a plug as the Spit-Fire. For any engine, any thread.

If You Want the Case Free, Send Your Order at Once

A. R. MOSLER & Co., P.O. BOX "M" MT. VERNON, N.Y.

WE OWN THE LARGEST FACTORY IN THE WORLD
DEVOTED EXCLUSIVELY TO THE MANUFACTURE OF SPARK PLUGS



CUT OFF AND MAIL TODAY
A. R. MOSLER & CO., Mt. Vernon, N. Y.
I enclose remittance for \$.....
Send me the free Leather Spark Plug Case with
Six $\frac{1}{2}$ " or Metric Spit-Fire Platinum Pointed Plugs, \$7.50.
Six $\frac{1}{4}$ -18 A.L.A.M. Spit-Fire Platinum Pointed Plugs, \$9.00
Name of Car.....
Name.....
Address.....
City.....
State.....

The B. F. Goodrich Company of Akron, Ohio, will be fully represented not only at the two shows to be held here in New York in January, but also at the Chicago Show in February and the Boston Show in March. They will have on exhibition we understand all of their specialties, including a regular line of tires as well as their Clincher and Quick Detachable tires. A novelty which they will show is the "P.P.P." (Puncture Proof Plug) which resembling a collar button in appearance and method of application, permanently and instantly stops any small puncture without cement or any adhesive whatever.

Rhineland Ball Bearings.—These are manufactured by the Rhineland Machine Works Co., 140 West 42d Street, New York City. They are used on a long list of the standard automobiles, in fact, some of the finest automobiles now made in the world are equipped with these ball bearings which in itself is, of course, a strong testimonial in their favor. Write for free catalog direct to the manufacturers and mention this magazine.

Important Announcements from Atwater Kent Mfg. Works.—In our advertising pages this month readers will find an unusually important announcement from the Atwater Kent Mfg. Works, 4033 Stenton Avenue, Philadelphia, Pa. This advertisement gives to the public for the first time a new schedule of prices on the Type F Atwater Kent Ignition System. And interesting information is also given concerning the special devices manufactured by this company for the installment of their Unisparker on Ford, Franklin, Buick and Maxwell cars where it is impossible to place the Unisparker directly on the timer shaft. Perhaps your present car only needs an Atwater Kent Ignition System to enable it to give you perfect service and we advise all of our readers not only to read the advertisement referred to but to write without fail for their booklet "G" which is full of interesting and instructive facts regarding the subject of ignition.

In writing be sure to mention this magazine.

Pacemaker Reinforcements.—These are said to be puncture and blow-out proof. They are guaranteed not to buckle, creep or affect the resiliency of the tire. They are also said to be self-vulcanizing. Write for circular and price list to the Auto Tire Brokerage Company, 1355 Michigan Avenue, Chicago, Ill. See the advertisement of this company on another page.

Gurney Ball Bearings.—These bearings combine the important features of having a full complement of balls, as well as continuous, unbroken and full depth raceways. They are made in standard sizes. Write for prices and catalogue to the Gurney Ball Bearing Co., Jamestown, N. Y.

Fairbanks-Morse Engines.—These engines are said to start easily without cranking, and develop more than their rated power. They are the result of over 30 years of engine building experience. Agents are wanted everywhere. Write at once for Catalogue No. CV1419 to Fairbanks, Morse & Co., either to Chicago or New York.

The Triplex.—The Bremer Wilson Mfg. Co., 1256 Michigan Blvd., Chicago, Ill., manufacturers of the "Triplex" which is said to finish the work the carburetor leaves half done. It is guaranteed to decrease fuel consumption 25 per cent. and increase power, prevent carbonization,

back firing, etc. But consult the advertisement of this company on another page. Dealers everywhere are urged to correspond with this company at once and get their special sales proposition.

Muller's "Reliable" Overhead Washer.—Ed. Muller, 1777 Broadway, New York City, manufactures an overhead washer, which we understand has proved to be entirely satisfactory wherever used. He makes eight different styles. Some of them are for sale by dealers. If your dealer does not happen to have them write direct to the manufacturer for full particulars and prices mentioning the Automobile Dealer and Repairer.

New Car Cleaner.

The Vanity Duster is the name of a liquid preparation being placed on the market to clean and polish automobiles. The manufacturers claim it is far superior to anything ever offered of its kind. This liquid is applied with a cloth and will clean, renew and polish the woodwork and all varnished work at one operation, bringing out the original finish, the same as new. The manufac-



turers claim it contains no grease, or oil. As indicating their confidence in this preparation, the manufacturers will send a sample bottle free to all interested. Address the Vanity Manufacturing Co., 565 Washington Street, Buffalo, N. Y.

To Keep Your Hands Warm.—One of the best Winter specialties ever brought to our notice is the Electric Warm Hand Steering Wheel. Every driver knows the discomfort of cold hands in the Winter season. By the use of this device you can be warm and comfortable while driving your car, even in a zero day or in a howling blizzard. The application of the heater to the steering wheel is exceedingly simple. All it is necessary to do is to take off the old wooden rim from your steering wheel, and substitute the one furnished by the manufacturers of this invention. This wheel is especially adapted to Ford cars and should interest every Ford car owner. It will be sent prepaid to any part of the United States on receipt of \$15, or can be supplied by any reputable dealer. Readers are urged to consult the full page advertisement which appears in this issue on our third cover page, and we suggest that you send in your inquiries and orders immediately, as this announcement may not appear but once in our columns. Address all correspondence to the Warm Hand Steering Wheel Co., 527 Fifth Ave., New York City, and to secure prompt attention be sure to mention this magazine. Good dealers are wanted to handle this article throughout the United States.

Horsely No-Cement Inner Liners.—These are made of four to five layers of rubber and cotton tire fabric for reinforcing automobile tires (inside) between tube and casing. The side that goes against the tire is especially coated and treated with a vulcanizing cement compound that when applied will adhere firmly without the use of cement. Get these inner liners from your dealer or write direct to the manufacturers, the Horsely Mfg. Company, 6104 Euclid Avenue, Cleveland, Ohio. The same company also makes the Horsely No-Cement patches. See advertisement on another page.

Mott's Patent Pressure for Vulcanizing.—These pressures are made by the Richardson Tire Company, 20 Ford Street, Hartford, Conn. They will work equally well with any vulcanizing machine, as they are the same shape and size as an air bag. It is said if these pressures are once used, they are always used. Write for further particulars to the manufacturers as above.

A Puncture for Two Cents.—The National Cement and Rubber Company, Dept. "A," Toledo, Ohio, has a full page in this issue of their Self-Curing Rubber Cement, which they say will repair a puncture for two cents and do it in four minutes. They also make four sizes, of brazing forges. This company especially invites dealers to correspond with them and get their catalogues and special rates.

Air Friction Carburetor.—This carburetor is made by the Air-Friction Carburetor Company of Dayton, Ohio, and is said to work perfectly in cold weather and to start easily on the coldest mornings. Motorists who have had trouble with their carburetor in cold weather will appreciate one that the cold does not effect. With this carburetor it is said that less gasoline is used. See the advertisement of this company on another page and write for further particulars and prices.

The M & M Economizer.—This is a device which is inserted in the manifold. It is made with one valve and six portholes and its object is to increase the speed and power of the car and to economize in the amount of gasoline used in the power plant of the car. This device is also a saver of brakes and it decreases the tire repair bills. The manufacturers claim that this invention will increase your speed and power 20 per cent. and that it will save 40 to 50 per cent. on gasoline and 40 to 50 per cent. on carbon. It also acts as a safety valve in case of a back-fire. The manufacturers of the M & M Economizer issue the strongest possible guarantee. They are willing to refund your money after thirty days' trial if the Economizer does not do all that they claim for it. The same manufacturers have also brought out a similar attachment for motor cycle engines. The cost of the M & M Economizer for automobiles is \$3.50 f.o.b. Philadelphia and it will be sent by mail for 17 cents extra for postage. The motor cycle device sells for \$1.25 prepaid. In sending your orders, please use the coupon attached to the full page advertisement which appears in another portion of this issue. If you do not care to purchase without further investigation, write for free catalogue and address all your correspondence to Moller Bros. Controller & Economizer Company, 700 Betz Bldg., Philadelphia, Pa. In writing you are requested to mention the Automobile Dealer and Repairer.

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garage set of double stocked plates cutting eleven sizes from 1/4 in. to 1 in., at the remarkably low price of \$18.75 prepaid. This is a mail order offer and the manufacturers will fill all orders at this rate if you will mention the Automobile Dealer and Repairer. They will also be glad to send to any reader their special threading tool catalogue. Address all communications to the American Tap & Die Co., Greenfield, Mass. Be sure and mention this journal.

Dealers everywhere should write for the attractive proposition of the W. H. McIntyre Company of Auburn, Ind., in connection with their McIntyre 6-40 Limited. This car contains so many points of importance and great value that it seems destined to have a large sale. Dealers who want territory should speak quickly. Either write or wire.

Ford Owners, Attention.—Every owner of a Ford car should be interested in the unusually attractive two-page announcement which appears in this issue of the K-W Ignition Co., 2817 Chester Ave., Cleveland, Ohio. This company manufactures a particularly interesting line of electrical specialties; many of them manufactured exclusively for Ford owners. Their electric headlight outfit for Ford cars, with fly wheel magneto, at \$15, is particularly desirable, also the K-W Master Vibrator which is now in use by 30,000 Ford owners and which also sells for \$15. The same company manufactures the K-W spark coil which is auto-synchronous. It gives a hot, fat spark, with a small battery consumption. Every reader should write at once to this company for their interesting illustrated catalogue which will be sent free if you mention this magazine.

Reduction in Tires.—The Lee Tire & Rubber Company of Conshohocken, Pa., have announced a reduction of 10 per cent. in the price of the Lee Puncture Proof Pneumatic Tire. This company has recently brought out a little booklet entitled "Pneumatic but Puncture Proof" and asks the privilege of sending a copy to every reader of the Automobile Dealer and Repairer. Send a postal card or letter and you will get it.

Ball Carbon Remover.—This carbon remover is made by the Ball Carbon Remover Company, 3416 Baring Street, Philadelphia, Pa. Write for further particulars and prices mentioning the Automobile Dealer and Repairer.

"High Water Mark"

This issue of the Automobile Dealer and Repairer represents "high water mark" in quantity of advertising.

Of course it is well-known that any publication these days is chiefly dependent on its advertising. Receipts from subscriptions will not meet a tithe of the necessary expenses.

We, therefore, urge our readers to not only read the advertisements but to answer them by mail, so far as practicable.

This is a substantial way in which you can show your appreciation of our efforts to publish a readable and instructive journal.

CHAMPION PRIMING PLUGS

End All Winter Starting Trouble

Every car owner is up against the priming question today. The trouble is greater this winter than ever before because the gasoline is of lower test.

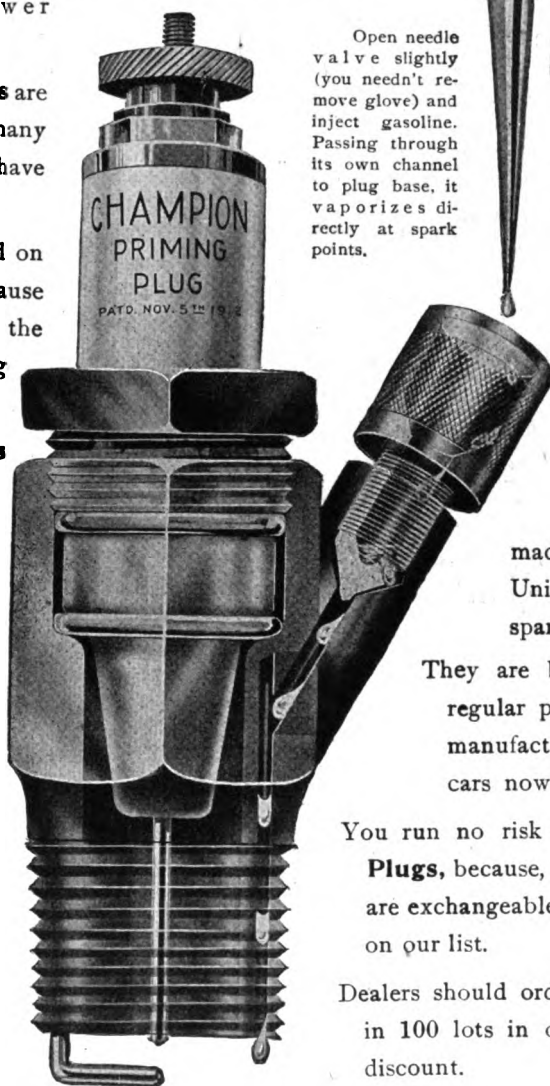
Champion Priming Plugs are indispensable to the many thousands of cars that have not priming cups.

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Open needle valve slightly (you needn't remove glove) and inject gasoline. Passing through its own channel to plug base, it vaporizes directly at spark points.

Champion Priming Plugs have been given every test, and are strongly recommended to dealers by manufacturers of those cars that are not regularly fitted with priming devices.

These recommendations were not made until the manufacturers were convinced of the thorough reliability of **Champion Priming Plugs** under the most severe conditions.

Champion Priming Plugs are made in the largest factory in the United States devoted exclusively to spark plugs.

They are backed up by the fact that our regular priming plugs are specified by the manufacturers of over 60 per cent. of the cars now running in America.

You run no risk in buying **Champion Priming Plugs**, because, like the rest of our product, they are exchangeable for any other type of spark plug on our list.

Dealers should order **Champion Priming Plugs** in 100 lots in order to get the lowest possible discount.

FOR SALE EVERYWHERE AT \$1.25 PER PLUG.

Trial Set of Four Champion Priming Plugs, Fully Guaranteed, Prepaid to Any Car Owner For \$5. Give Name of Car and Year of Make—Also Name of Your Dealer.

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PLUG COMPANY,

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Touring Body, 2 door. 35.00
Touring Body, 4 door. 40.00
Touring Body, 4 door, 5-passenger. 52.50
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Catchiest Novelty. Everybody sees and keeps your Ad. Write for catalog and quantity prices.

Sample 2½ in. fob, tire on wheel, 35c.; 1½ in. fob, tire only, 10c. Paperweight on wheel 25c.

Prompt delivery.



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I know how hard it is to persuade a man to order his first box of cigars by mail. I have been doing it for about ten years.

Also, I know that unless that first box of cigars gives complete satisfaction a man will never buy cigars by mail again.

I have understood this principle all along—my offer, my advertisements, my cigars are all made with but one object—the repeat order.

I try to make my Shivers Panatela so good that the man who smokes a few of them will begin to look forward to luncheon more eagerly when he anticipates smoking a Shivers' Panatela afterward.

My Pantela has a filler of the best Cuban grown tobacco—real, long Havana leaf, and a wrapper of the finest imported Sumatra. The cigar is hand-made in my model factory by skilled adult men cigarmakers.

I make to smokers an offer that permits them to try my cigars without obligating themselves to spend a penny. Upon the ten cigars which are smoked free I depend absolutely for my repeat order. Without repeat orders I lose money, but in most cases when a man begins to smoke my cigars he continues to smoke them. Failure to get this repeat order is the obstacle over which my imitators have stumbled.

Here is my offer: I will, upon request, send fifty Shivers' Panatelas on approval to a reader of the *Automobile Dealer and Repairer*, express prepaid. He may smoke ten cigars and return the remaining forty at my expense, and no charge for the ten smoked if he is not pleased with them; if he is pleased, and keeps them, he agrees to remit the price, \$2.50, within ten days.

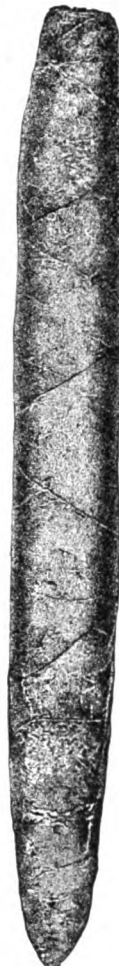
This offer does not apply alone to my Panatela. I make a number of different shaped cigars of Havana and Sumatra wrapper, and also clear Havana cigars. Every cigar I make, I sell by the terms of the above offer.

If you prefer a certain shape of cigar different from the Panatela, ask for my complete catalog. I feature my Panatela only because it has become my most popular cigar. If you like a Panatela, accept my offer now. There is no way you can lose.

In ordering please enclose business card or give reference, and state whether you prefer light, medium or dark cigars.

HERBERT D. SHIVERS

913 Filbert Street Philadelphia, Pa.



Shivers' Panatela
EXACT SIZE
AND SHAPE



MOORE TIRE-SAVING JACKS

\$6.50 Per Set of Four—Delivered



THE best of tires wear out plenty fast enough while working on the road, without hastening their destruction when they're supposed to be "resting" in the Garage!

The weight of your car bearing down continually at one point, makes them flabby, unable to resist wear—actually kills the elasticity—the very life of the rubber—and paves the way for punctures, blow-outs, early destruction of the entire fabric.

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For Winter Storage—Great!

Don't "block up" your car for the winter. A set of Moore Jacks will do the work just as well—and when a nice day comes along, you're ready for a spin in less time than it takes to tell about it.

If your dealer cannot supply you, send in your order direct.

J. C. MOORE & CO.

326 Wisconsin St.,
Racine,
Wis.



J. C. MOORE & CO.,

326 Wisconsin Street, Racine, Wis.

Please ship, at once, one set of Moore Tire-Saving Jacks for which \$6.50 is enclosed herewith.

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4
**ABSOLUTE
NECESSITIES**



REX INCONCEIVABLY DELICATE NICKEL POLISH

SAVES YOUR EXPENSIVE NICKEL PLATING

Made especially for cleaning and repolishing NICKEL PLATING, NICKEL PLATED LAMPS, GERMAN SILVER REFLECTORS, and all German Silver and NICKEL PLATED ACCESSORIES.

Composed of pure neutral oils, and fine abrasives obtained by collecting the dust arising from our milling machines. Contains no Ammonia, Acid or Grit. Never settles in the can, the fine abrasives remaining always in suspension.

NOTE.—Not intended for quick, easy removal of heavy tarnish, but to **save nickel plating** while keeping it in fine satin finish from the time it is new, or after it is put in condition from heavy tarnish or oxide, by use of

REX METAL CREAM POLISH

The "superlative degree" in metal polish for GENERAL USE on BRASS, COPPER, STEEL, Etc.

Contains no acid or grit to injure. Does not leave that "vulgar white shine" so common to metal polishes, but brings out the rich natural lustre of the metal itself, leaving the surface of the metal BURNISHED and RESPLENDENT.

NEVER SETTLES SOLID IN THE CAN.

Made by the manufacturers of the
ALWAYS DEPENDABLE, EVER SATISFYING

REX STAPLES:

REX WOOD OIL for repolishing Automobile Bodies, Hardwood and Furniture, and

REX LEATHER DRESSING, the black waterproof finish for Tops of Autos and Carriages; Leather, Mohair, Pantasote, Canvas, Repair Work, etc.

LARGE SIZE CANS OF REX STAPLES SOLD BY ALL DEALERS IN AUTO SUPPLIES.

SMALLER HOUSEHOLD SIZES at all first-class HARDWARE, GROCERY and DRUG STORES.

Write for Full Information.

ARMIGER CHEMICAL CO., Chicago, U. S. A.

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All The New Cartercars Are Very Good

In the new Cartercar Models shown here you will find all the good features of the previous Cartercars with a few improvements, and the very latest ideas in body designing. We are certain that, when you ride in any of these, your verdict will be "A Very Good Car."

New Electric Starting and Lighting System

Just press down a small knob and the engine is cranked—turn the same knob and you light all or as many of the lamps as you wish. Simple, isn't it?—yet it is always reliable. We have tried this system out under all conditions and it has proven 100% efficient.

Friction Transmission the Same

We didn't even try to improve the Friction Transmission. This feature is largely responsible for the great popularity which the Cartercar is enjoying today. You have still the unlimited speeds—the one lever control—and the Cartercars will still climb 50% hills as easily as ever.

Simplicity a Big Feature

Cartercars are built to give service to the man who knows nothing about mechanics. They are controlled simply—and always from the seat. All the driver has to learn is to move a lever forward and backward.

Save 1-3 to 1-2 of Your Tire Bills

Jerks and jars are eliminated by the Cartercar Friction Transmission. You can easily see how this means a much greater mileage from your tires. Many owners say that they have secured about twice the ordinary wear. Of course, this smooth running means less upkeep expense for all parts.

The Service You Want

Your Cartercar will take you just where you want to go. You don't have to consider whether the roads are good—or the weather satisfactory. You have a car that will travel up hills and through mud and sand. The Friction Transmission is the strongest and most efficient feature of the Cartercar.

Now Consider the Price

The Cartercar is just as serviceable as any car can be. The ordinary low priced car cannot give satisfactory service for a very long time. The Cartercar is the medium priced car that gives the high priced service. You do not invest in unnecessary luxury or reputation. You cannot afford to buy a cheaper car if you want service—and it is not necessary for you to spend more.

Let us send you our new catalogue, which will tell you more about this splendid car. We will exhibit at all of the big Winter Shows and will be pleased to meet you there.



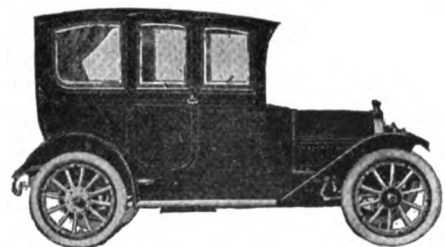
Model 5A Five-passenger Touring Car—116 inches wheel base—36 x 4 Tires—Right hand drive—Control lever inside on right—Electric lighting and starting system—and full equipment—f. o. b. Pontiac—\$1700.



Model 5B Roadster—two-passenger—116 inches wheel base—Right hand drive—Control levers inside on right—Electric starting and lighting system—and full equipment—f. o. b. Pontiac—\$1600.



Model 5C Colonial Coupe—three-passenger—Right hand drive—Control levers inside on right—Electric starting and lighting system—and full equipment—f. o. b. Pontiac—\$1900.



Model 5D Colonial Sedan—five-passenger—Right hand drive—Electric starting and lighting system—and full equipment—f. o. b. Pontiac—\$2000.

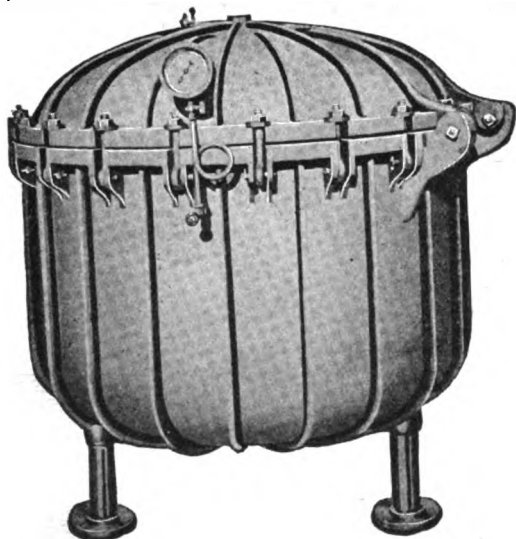
Cartercar Company

PONTIAC, MICH.

Branches: Chicago, New York, Detroit, Kansas City, and Atlanta, Ga.

RETREADING KETTLES

3 SIZES



These Kettles fill a long felt want in every repair shop. They are made of cast iron, and so constructed as to give the greatest strength with the least weight.

These kettles stand on three legs, but having a hinged cover they may be placed on their side on a brick or cement pier, with the cover swinging to one side. They are fitted with steam gauge and air cock.

The small kettle has a capacity of six tires, 38x5 inches. Weight, 1800 lbs.

The medium size kettle has a capacity of four 42x5 inch tires. Weight, 1800 lbs.

The large kettle has a capacity of six tires 42x5 inches. Weight, 2300 lbs.

RETREADING COILS



The above cut shows a section of a flat wire coil which is used to take the place of air bags in the retreading of tires.

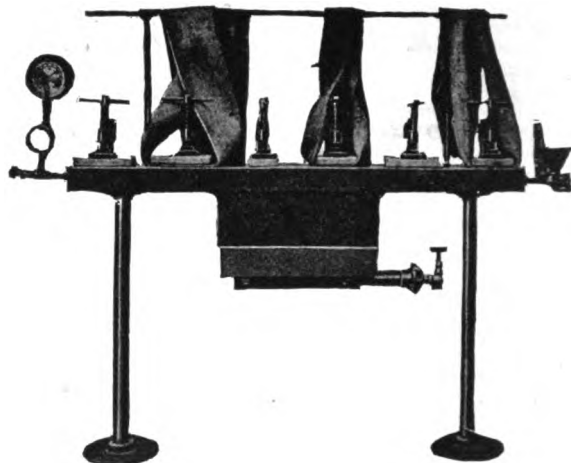
INSIDE VULCANIZER



Used for curing the inside of casings of all sizes.

TUBE VULCANIZER

No. 4



This Vulcanizer is fitted with six adjusting clamps, which swing to one side while putting tubes on vulcanizer.

This Vulcanizer is 46 inches long, 5 inches wide and 3 inches deep, with an extra deep water chamber. It is fitted with gas burner to generate its own steam.

The top is absolutely flat and is highly finished. Weight, 255 lbs.

Our New No. 8 Adjustable Sectional Vulcanizer With Three Cavities



As a Progressive Business Man you should by all means use, handle or recommend our

New Improved Auto-Tire VULCANIZING MACHINE

simply and solely because it is the best there is in Vulcanizers at any price and because the price isn't much, the operation is easy and profits are exceptionally large.

Our machine is different, far better and more economical in operation and investment cost than any other made. In all features it is superior to all other devices there is hardly a comparison.

We have some facts that will interest you and that will put you in the way of big profits. In your own interest, get posted—Write to us to-day.

AUTO-TIRE VULCANIZING COMPANY,

LOWELL, MASS.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



Franklin Dealer Proposition

This book will show you why the Franklin dealership is a profitable one. Send in your application at once.

The dealer who handles the Franklin has a car with six exclusive features, each one of which is a sales clinching fact.

ENTZ ELECTRIC STARTER AND LIGHTING SYSTEM

A real self-starter with really original features. You throw the switch "on" and the motor starts—no buttons, levers or pedals. In crowded traffic, if you slow the engine down to where it would ordinarily stall, the starter picks it up and starts it running again without any action on the part of the driver. A permanently connected starter without change gears.

THESE ARGUMENTS SELL FRANKLIN CARS

These are the arguments you can bring to bear upon the prospect when you show him the Franklin: (1) Uses less gasoline; (2) Uses less oil; (3) Wears out fewer tires; (4) Travels faster in the long run; (5) Rides easier; (6) Lasts longer.

Franklin dealers are making money and Franklin sales are increasing steadily every year. The Franklin now stands third in sales among all high-grade cars, and rapidly gaining on second place. The "Franklin Dealer Proposition" shows why this is so.

A PERMANENT BUSINESS CONSTANTLY INCREASING

One of our dealers says: "I could not very well drop the Franklin if I wanted to. Everywhere I have sold them I have created a permanent business. Franklin owners come back year after year."

The Franklin dealer does an all-year-around business. This means a profitable garage business. Franklin cars keep going summer and winter. They keep going because Franklin direct air cooling is not affected by weather conditions. They keep going because the owners can afford to drive them. They do not cost heavily to operate. If you sell Franklin cars in your territory you have a steady year-around demand for gasoline, oil, tires and accessories.

CONTINUOUS PRODUCTION INCREASES SALES

Our continuous production policy makes the Franklin dealership a good proposition for the dealer. You can always offer the very latest model with the newest equipment. There are no "off months" waiting for the so-called yearly announcements. Franklin dealers do a good business every month in the year.

SEND FOR FRANKLIN DEALER PROPOSITION

Chicago increased sales over last year, 195%; Philadelphia over 857%; San Francisco over 200%; New York over 72%; Boston over 104%; Cincinnati over 500%. There is a big increase all along the line.

The Franklin Dealer Proposition will explain how you can get your share of this big increase.

Franklin Automobile Company, 29 Franklin Square, Syracuse, N. Y.

DEALER APPLICATION

FRANKLIN AUTOMOBILE COMPANY
Syracuse, New York

Please send "Dealer Proposition" as advertised in December Automobile Dealer & Repairer.

Name.....

Address.....

Available Capital.....

Shop Facilities.....

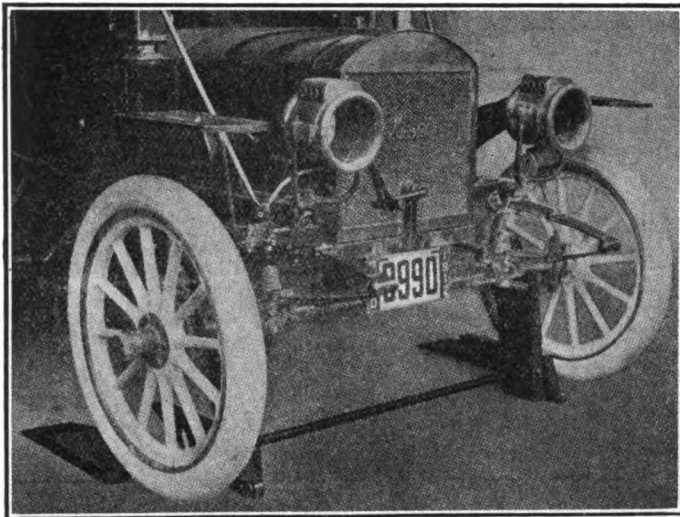
Three references.....

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Cars handled now.....

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SAVE YOUR TIRES BY USING HART'S Automatic Adjustable Auto-Jack

Send for Catalog A. AGENTS WANTED.

For circulars telling you all about it ADDRESS

C. A. HART,

Patentee and Manufacturer, 520 N. Main St., Findlay, O.

It means MONEY to you, Automobile Owners!



THIS little book was written especially for beginners. Either the man who uses an engine for pleasure or profit, but who has not time to study a technical book.

It gives full details in connection with running gasoline engines, stated in simple language that anybody can comprehend. It contains numerous illustrations.

A copy will be sent you on receipt of the price, 25 cents, in postage stamps.

Motor Vehicle Publishing Co.,

71-73 Murray Street,
NEW YORK CITY.

A 100% DIVIDEND IN 90 DAYS

That is what nearly every owner of an Imperial Gasoline Gauge will tell you was the result of his investment in an Imperial.

What You Can Expect From An IMPERIAL GAUGE.

It will give you the accurate capacity of your gas tank. It will detect slow leaks that may be wasting gallons of gasoline daily or weekly.

With it you can tell when your carburetor is flooding and wasting fuel.

It will enable you to keep a check on your engine so you will know when you are getting the proper mileage per gallon.

When purchasing gasoline, it will measure it accurately for you.

It eliminates your troubles of measuring your gasoline supply with a stick, removing tank cap, and other inconveniences.

It will also tell you accurately the amount of gasoline you have in your gas tank.

When you own an Imperial Gasoline Gauge you will learn to drive your car so as to get the greatest maximum mileage per gallon, AND WHY?

Because it enables you to keep in accurate touch with the operative condition of your car.

**YES, THE IMPERIAL WILL FIT YOUR CAR,
NO MATTER WHAT MAKE.**

WHEN ORDERING simply state Name and Model, also style of finish, Polished Brass, Black or Bright Nickel.

The Imperial Gasoline Gauge can be installed by anyone, we furnish complete directions, also all parts and connections necessary.

We prepay express anywhere in the United States and Canada.

ARE YOU BUYING A NEW CAR?

If so, demand that an Imperial Gasoline Gauge made at Canton, O., be part of the equipment. Many manufacturers have already adopted it.

DEALERS, order your cars equipped with an Imperial, it means added selling argument for you and satisfaction for your customers.

Agents Wanted. Special Prices to Dealers.

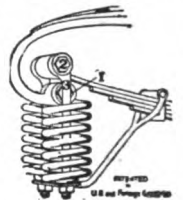
Send immediately for descriptive circulars and price.

THE IMPERIAL FLUID GAUGE CO.,
334 EAST 8TH STREET, CANTON, O.

Buy the Genuine SUPPLEMENTARY SPIRAL SPRINGS

The most luxuriously upholstered, the best tired car, cannot give comfort to its occupants unless it has proper spring suspension.

ST. LOUIS Supplementary Spiral Springs are the one logical solution of the spring problem. Their use means increased speed, more comfort, greater economy and added safety.



Send for our catalog, advising us the Make, Model, and Year of your car, and we will quote you.

The St. Louis Supplementary Spiral Spring Co.,
1779 Broadway, New York City

**30%
More Mileage**

**Save
The Tires**

Every automobile owner and every dealer has been interested in watching our National advertising of Tirennew. The big demand it has created means profit to the dealer.

Narco
Product
SELOUIS, U.S.A.

TIRENEW
TRADE MARK
Prevents Tire Decay

is a liquid, unvulcanized rubber compound made with a base of pure gum—waterproofs and protects from oil, moisture, sun and air. **Makes Tires Look Like New.** There are imitations which paint but don't protect—insist on Tirennew. Send \$1.00 for a can—enough to Tirennew 8 tires. Ask about our other products:

Narco Rubber Reviver	Non-inflammable Rubber Cement	Leakanot, a liquid, rubber, waterproofing dressing for anything leather.
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NATIONAL RUBBER COMPANY, 4440 Papin St., St. Louis, Mo.

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Now Europe, Too

The Michigan "40" Wins World-Wide Acceptance as Leader of Its Class

Hundreds of dealers have come to this factory to see the new model of the Michigan "40."

In the first 30 days they left with us orders for 6,125 cars.

These men believe that this car is bound to lead the Forties this year.

Then Europe Came

Then came experts from Europe—artists in cars. Men who must compete with the finest cars in the world.

They came from England, Scotland, France, Russia, Germany and China. And these men agreed that no medium-priced "40," either in Europe or here, had so many attractions.

Some of the world's leading dealers, including the German Packard Motor Car Co., took our agencies abroad.

These Men Know

These experts and dealers, some of whose orders approach \$1,000,000, don't make mistakes on cars.

Their tests were searching and extreme. Some of these men spent weeks in our factory.

They know the whole market. When they unite

in this way on the Michigan "40" their judgment can well be regarded as final.

Which Won Them

These men were brought here by the fact that W. H. Cameron is this car's designer. There are 100,000 successful cars which tell what he can do.

This new model results from four years of development. And 5,000 cars have been built in those four years to prove out 300 improvements.

The body is a John A. Campbell creation. It has 14-inch Turkish cushions and 22 coats.

The car has a four-forward-speed transmission. It is vastly over-tired. It has center control, left-side drive, electric lights with dynamo.

It represents the last word in comfort, luxury and strength.

There is not another car with so many attractions sold at anywhere near this price.

The Michigan "40" is one of the most-talked-of cars in America. You never saw more effective advertising. And our advertising expenditure for the 1913 season is \$350,000.

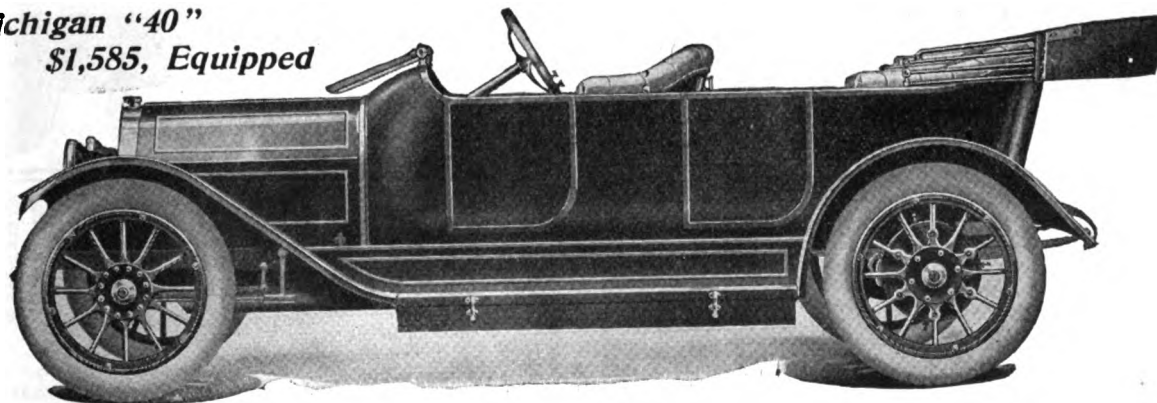
We can take care of a few more dealers in territories not yet closed. Write for our proposition.

MICHIGAN MOTOR CAR COMPANY, Kalamazoo, Michigan

Owned by the Owners of the Michigan Buggy Company

Michigan "40"

\$1,585, Equipped



SOME OF THE MICHIGAN FEATURES

Four-forward-speed transmission
Oversize tires—35x4½
Electric lights and dynamo
Center-control—left-side drive
Motor, 4¼x5¼
Extra effective brakes—16x2¼ in.
Big, comfortable springs
Adjustable steering post
Adjustable pedals
Firestone Q. D. demountable rims—extra rim

14-inch Turkish cushions
Rear cushion 50 inches long
Hand-buffed leather upholstery
Best curled-hair filling
Wheel base 118 inches
Nickel mountings
Large over-capacity, giving big factors of safety
Pressed steel, full floating rear axle
Axles sufficient for an 80-horse-power car

Genuine cellular-type radiator
Best mohair top, side curtains and envelope
Windshield built in as part of body
Electric horn
\$50 speedometer, 4-inch dial
Special foot rail
Swing robe rails
Rear tire irons
Complete tool equipment
Tool chests under running boards

There is such a difference of opinion about the various types of self-starters that we have not adopted any one type as regular equipment. We prefer to leave this selection to the buyer. We equip with either the gas or a positively efficient electric starter at moderate extra price.

(136)

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The BRENNAN

A HIGH GRADE
MODERATE PRICED
MOTOR

An Absolutely Reliable Motor
backed up with 12 years' experience.

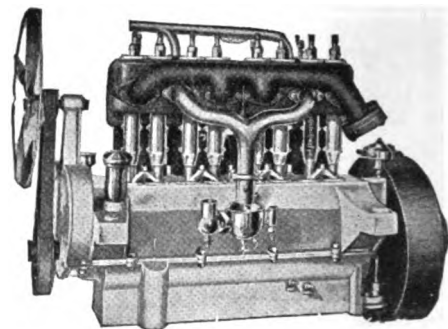
Thoroughly tested and guaranteed. LARGE BEARINGS, LARGE VALVES, LONG STROKE.
Our model B has demonstrated its ability to give perfect results in touring cars, commercial cars, tractors, etc., and are guaranteed to give satisfactory results.

We shall be pleased to forward blue prints, catalogue and full information on request.

BRENNAN MOTOR CO.

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Syracuse, N. Y.



Four Cycle, Four Cylinder Motors for Elmore or any standard make of car.



Something You Want!

Special set comprising a tap and die for every size and thread used on Ford Model T Automobile; also a stock for every die, a wrench for every tap. Cased in a neat, special cabinet.

Also handy for any automobile.

Ask for Ford Model T Screw Plate.

Wiley & Russell Mfg. Co.
GREENFIELD, MASS.

"WE WANT TO MEET YOU PERSONALLY"

At the NEW YORK SHOW

Balcony Booth 457,

GRAND CENTRAL PALACE, New York, N. Y.

The American Tire & Rubber Company
AKRON, OHIO

MANUFACTURERS OF

REINFORCED AMERICAN INDIAN AND REINFORCED AMERICAN
GRAY INNER TUBES,

5 MINUTE CURE VULCANIZING CEMENT.

RUBBER ACCESSORIES,

REPAIR MATERIALS,

SOLID TIRES,

STEAM PACKINGS, Etc.

Come and sit in the chair of honor and register your name with us.

BELT AND MOTOR DRIVE AIR COMPRESSORS AND SUPPLIES

TO SUPPLY AIR FOR
INFLATING TIRES

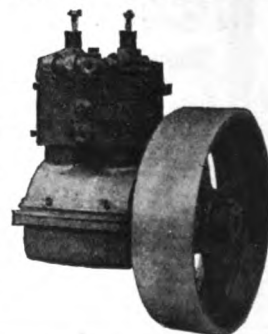
CLEANING MACHINES

OPERATING TOOLS

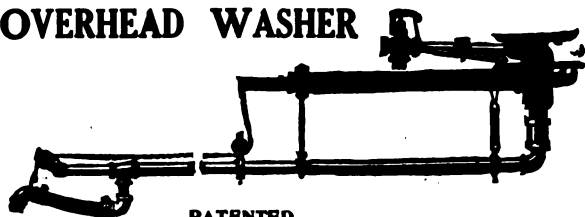
CONVEYING OIL or GASOLINE
UNDER PRESSURE.

Write for Circular and prices.

R. SPICER & CO.,
GROTON, CONN.



THE MULLER "RELIABLE" OVERHEAD WASHER



PATENTED

The Only Satisfactory Automatic Washer.

50 in use daily by Automobile Club of America for past two years; also by American and Adams Express Companies and most of the largest concerns in United States. We make eight different styles of washers. Ask your dealer or write us for full particulars. Manufacturers of movable electric light washstands.

Factory, 1304 John St.,
Cottontown, N. J.

ED. MULLER

Office,
1777 Broadway, New York.
Phone 6729 Columbus

SPLITDORF

"Always There"

SPLITDORF IGNITION devices are guaranteed for service—the appearance of the "X," "Y," "W" and "Z" magnetos and the "TS" coil insure even higher efficiency in the future while the plugs are always STANDARD.

Write for new catalog

SPLITDORF ELECTRICAL CO.
28 Warren Street, Newark, N. J.

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BE YOUR OWN REPAIRMAN



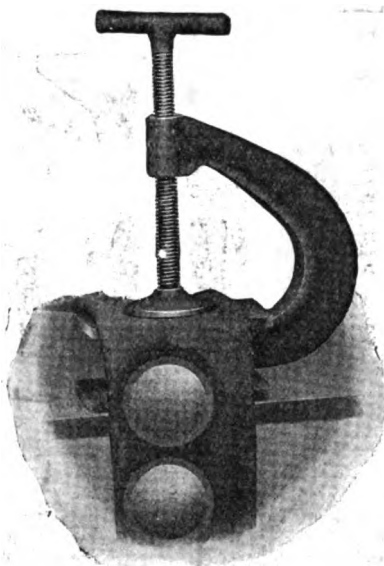
**You can Repair a Puncture
for 2 Cents
CAN BE DONE IN 4 MINUTES**



Inner Tube Patching Clamp

Requires no Heat and no Acid which destroys the tube.

This machine simply welds Rubber to Rubber with a cold process.



Inner Tubes repaired in this way should last at least 5 years.

Agents wanted in every town and city. \$5.00 to \$10.00 per day for LIVE WIRES.

No. 3 Brazing Forge



**Most Powerful Forges
in the World.**

**4 sizes for all kinds
of work.**

(Patents applied for.)

Brazing Spelter



Highest Quality.

Manufacturers of High Grade Rubber Cements

for the
AUTO, MOTORCYCLE and BICYCLE TRADES.

We are shipping to every State in the Union. We have a reputation.

DEALERS WANTED.

Send for Catalogue and Prices.

Address DEPT. A,

**THE NATIONAL
CEMENT & RUBBER CO.**

TOLEDO, OHIO, U. S. A.



No scales on your work.

**BEST
EVER
MADE.**



This cast Iron Brazing Compound needs no spelter.

It does the work all by itself.



NATHAN



"PRESTO"

Price, regular, \$1.75.
Price, dem. rim, \$2.20.



"KEystone"

Price, regular, \$2.00.
Price, dem. rim, \$2.45.



No. 37.
Bag for one inner tube.
Price 35c.



No. 36.
Bag for two inner tubes.
Price 55c.



Starting handle holder. No. 508.
Price, 45c.



No. 508 A. Price 50c.



Magneto covers.
No. 901, leather, \$1.75.
No. 902, leather duck, 60c.



Top Slip Covers a Specialty.



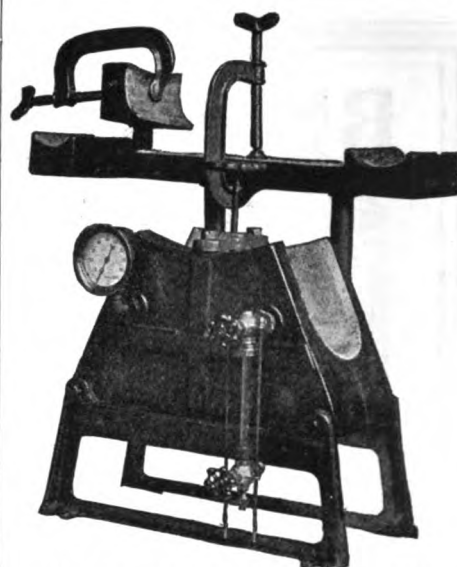
No. 04, spark plug case. Price 25c.
Any article sent prepaid on receipt of price.
Money back if not satisfactory and returned within 10 days.



ALL STYLES OF LEGGINGS.

Here we show a few of our articles. Our Auto and Motor Cycle Catalogues (mailed on request) contain descriptions and prices of many others. Send for them NOW. Special quotations for Jobbers and Dealers.

NATHAN NOVELTY MFG. CO.
84 to 90 D. R. Roade St., New York City, U. S. A.



No. 2 STEAM VULCANIZER

And Combination Case and Tube Attachment equipped with our quick steaming 12 tube boiler makes an ideal repair outfit at very low cost. Repairs 4, 4½, 5, and with shell 3 and 3½ cases. Easy to learn. Our catalogue tells how. Big profits in it now.

VANDERPOOL TIRE & RUBBER CO. Springfield, Ohio.

The U. S. Ratchet Wrench Set



No complaints of breakage—and thousands in use.

Get in line with the best. Extra value.

Write for special introductory price.

U. S. RATCHET WRENCH CO.

Peoria, Illinois.

Worko

—a gas engine tonic with laxative qualities.

—for weak, carbonized motors that knock, overheat and dirty your spark plugs unusually fast.

—\$1000.00 guarantee. Trial package, clean 24 cylinders, \$1.00, delivered to you.

WORKO

THE WORKO CO.

130-35 Winslow St.,

removes carbon. RACINE, WISCONSIN

Firestone

SMOOTH TREAD
or NON-SKID Tires


REDUCE TIRE AND CAR UPKEEP



**"A Giant in Power
—A Miser in Fuel"**

25% to 60% more mileage.

SCHOEN-JACKSON COMPANY,
MEDIA, PA.



With the **FLENTJE** Automatic Hydraulic Jounce and Recoil PREVENTER the **SIMPLEX AUTOMOBILES** of New York ARE EQUIPPED

WHY? Because it is the BEST in the World, and is backed up as such with \$5000.00 a side. THIRTY DAYS FREE TRIAL. TWO YEARS GUARANTEE.

Patented 1908, 1909, 1910, 1911, 1912.
For Particulars, apply to

ERNST FLENTJE, Cambridge, Mass.
New York Branch, 1926 Broadway, Room 400

Nemo Hard Rubber Air Drying Enamels.—These are made by the Nemo Chemical & Paint Mfg. Company., of Minneapolis, Minn., and are celebrated for their lasting qualities. They are guaranteed not to flake or peel off from heat. Furthermore, they will air dry quickly and to a bone hardness equally as good, the manufacturers say, as baked enamel finish. The same company makes the Nemo Radiator cement, which is guaranteed. A tablespoonful, it is said, will stop a leak in a radiator in a minute. They make the Nemo leather enamels that refinish worn leather or Pantasote tops and seat cushions. It dries overnight. Their Nemo Mohair Waterproofing will refinish and waterproof your shabby leaking mohair tops. Nemo Cylinder Enamels will not crack from heat or oil splashes. But write for the 1913 catalogue giving full particulars. Dealers and jobbers are requested to write for a specially attractive proposition.

Cigars by Mail.—Those of our readers who have not yet availed themselves of the liberal offer of H. D. Shivers, 913 Filbert Street, Philadelphia, Pa., whose

advertisement will be found on another page, are urged to do so. Mr. Shivers takes all the risk. He will send you 50 cigars at his expense, expressage prepaid, and you have the privilege of smoking ten of them and returning the remainder at his expense, if you do not like them. If you do like them, of course, you will send him the money. There is absolutely no expense attending a test of Mr. Shivers cigars, and we can state from experience that they are good.

The U. S. Ratchet Wrench Set.—This set is just what every owner of an automobile ought to have. They are made very strong, so there is no chance for breakage. Thousands of them are in use we understand. They retail for \$7.50 but the manufacturers are now making a special introductory offer, and they want every reader to write to them for further particulars and special price, addressing the U. S. Ratchet Wrench Company, Peoria, Ill.

Subscribe to the "Automobile Dealer and Repairer," \$1.00 Per Year.

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Be Your Own Repair Man

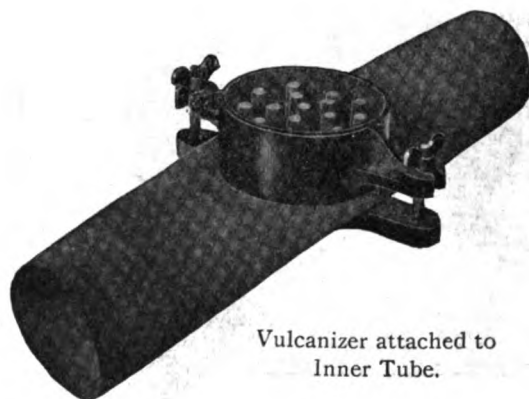
AND USE OUR

BUCKEYE VULCANIZING OUTFIT

COMPLETE
ONLY **\$1.50**



Vulcanizer Without Inner Tube.



Vulcanizer attached to Inner Tube.



COMPLETE OUTFIT

WITH
1 ROLL OF RUBBER.
1 GAUGE
1 EMERY PAPER
1 VULCANIZER

WHY NOT DO YOUR OWN REPAIRING

As you can save 90 per cent. of your repair bills?

It will repair a puncture for 2 CENTS.

Why pay 50 Cents to your Repair Man?

This Vulcanizer is guaranteed as we represent it or your money refunded.

AGENTS AND DEALERS WANTED

Fill out the Coupon below and send it in to-day. 

DAYTON INNER TIRE & MFG. CO.
DAYTON, O.

Enclosed is **\$1.50** for which please send me a
Buckeye Vulcanizer and Complete Outfit.
NAME.....
TOWN.....
STATE.....

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"STAPLEY" TIRE PUMP

Made by Bridgeport Brass Company

INFLATES TIRES IN A JIFFY

A few strokes with this very powerful pump and the job is done. No back-aches, no blistered fingers, no effort. The STAPLEY pump is certain and sure in action, is the most necessary of ALL accessories.

Always Ready --- Always Works

The STAPLEY is a compound pump. It injects a great quantity of air on every stroke. No trouble to inflate tires with a strong, non-leakable pump like this.

It has seamless brass tube cylinders. It can't rust. Has heavy, cast base, built to withstand the roughest service. Automatic valve-opener—and no complicated parts.

It's hard for us to supply the demand for STAPLEY pumps. Most every motorist prefers the STAPLEY. There's an accurate, guaranteed pressure gauge attached—if you want it.

You know the reputation of the STAPLEY. Get yours today. You'll need it. Above all things don't purchase an ordinary, leaky tire pump. Get the best—the STAPLEY. Ask your dealer.

Get Your Stapley Today

Without Gauge \$4.00

With Gauge \$6.00

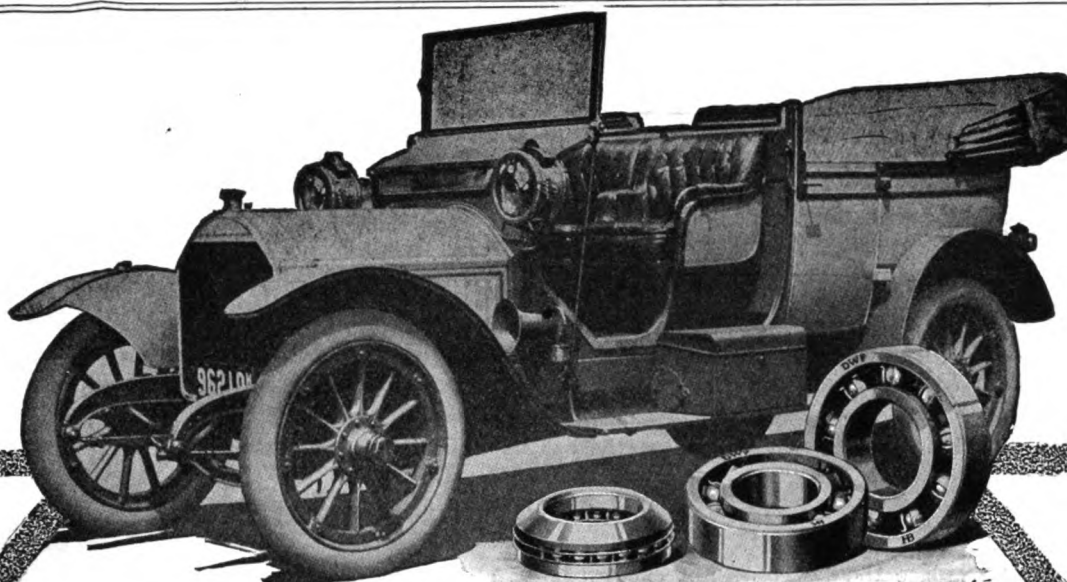
BRIDGEPORT BRASS COMPANY

P. O. Station D

Bridgeport, Conn.



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Crane Touring Car. Built by the Crane Motor Car Co., Bayonne, N. J.
Hess-Bright Ball Bearings used in transmission and both axles,
also in fan, steering gear and clutch shifter

Where Cost Is No Object

Certain American cars—the aristocracy of their kind—are built, literally, without regard to expense.

Not recklessly, for the mere sake of claiming an expensive car; nor wastefully, by the outlay of money on non-essentials.

No—but scientifically, in the deliberate intent to produce the most efficient, most durable, most luxurious and satisfying car of a given size or power that trained engineering skill can achieve.

Such cars are never cheap. But they give a sense of finality, of perfection and faultless service, which the car built to sell at a price never can touch.

Probably you can name those cars; some have great names; others are built for a few initiates only. But it is significant that these patrician cars—into which only the best of everything enters, regardless of expense—are generally equipped with

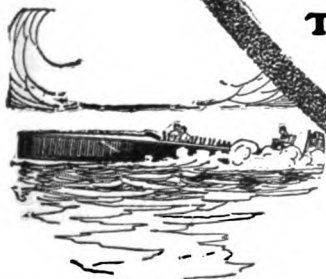
HESS-BRIGHT BALL BEARINGS

Built for Endurance

An interesting booklet, giving the reasons for Hess-Bright durability will be sent to any address on request. It gives facts—not mere generalities.

The Hess-Bright Manufacturing Company

25 East Erie Avenue, Philadelphia, Pa.



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REAL COLLISION AND

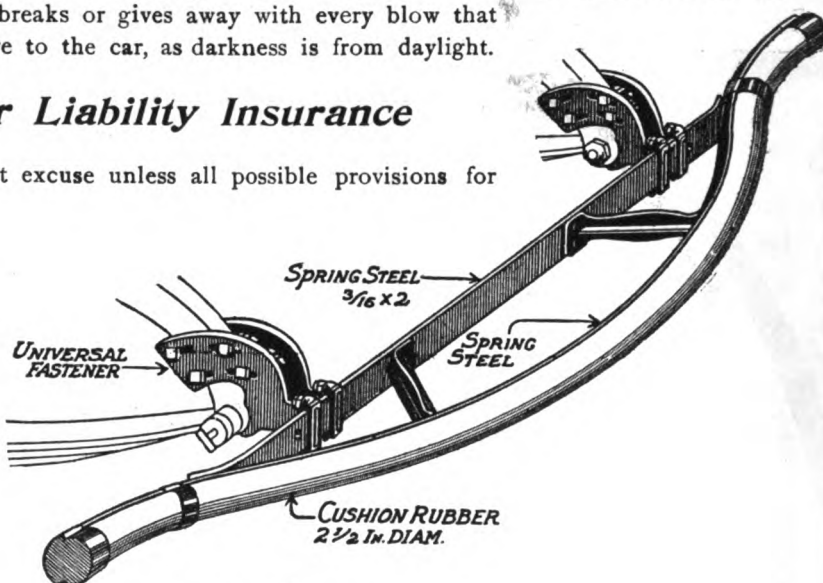
Put This Fender on Your Car for Protection

THE AUTO CUSHION FENDER not only protects the front of your car from damage, but also prevents many serious accidents that would inevitably occur without it. It is as different from the ordinary auto "bumper," which bends, breaks or gives away with every blow that is serious enough to do any real damage to the car, as darkness is from daylight.

Better than Life or Liability Insurance

In the first place the law does not excuse unless all possible provisions for safety have been taken advantage of.

THE AUTO CUSHION FENDER won't bend or break the first time you run into anything. It wards off blows without injury and absorbs the shock by means of the rubber cushion and the spring steel frame.



Auto Cushion Fender Company, 20 West Spring Street
COLUMBUS, OHIO

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LIABILITY INSURANCE

THE AUTO CUSHION FENDER

*The Only Steel Truss Rubber Cushion Fender
in the World.*

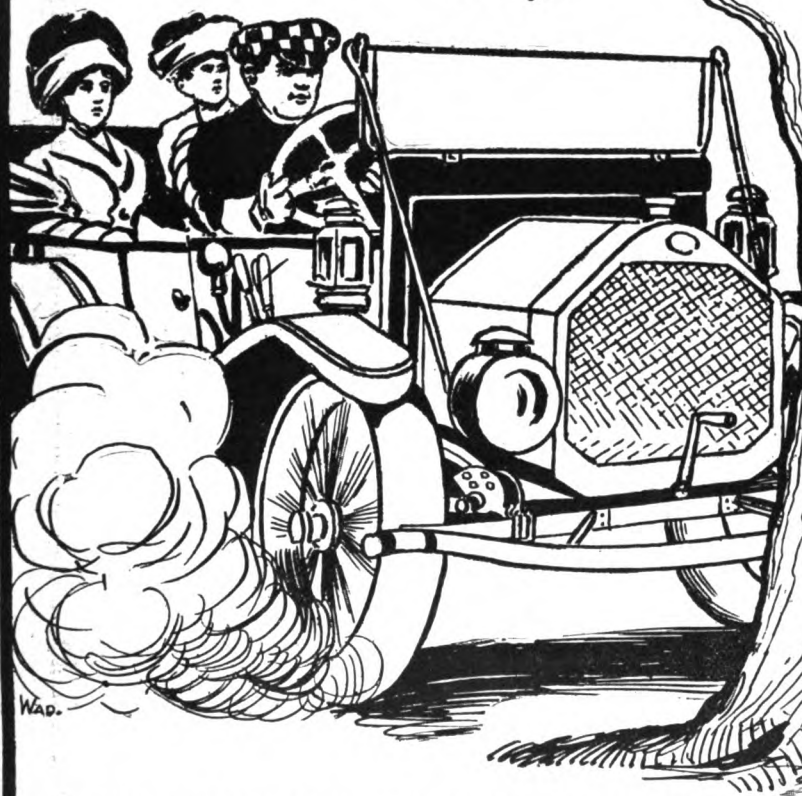
It is handsome in appearance, although it is not made for ornament. It is made for the express purpose of protecting your car from damage, as well as many serious accidents to pedestrians.

This fender is mechanically correct in design. You don't have to bore holes in the frame and weaken it. Our universal fastener fits any car and holds rigidly without trouble. Quick and easy to install.

Those who have used the Auto Cushion Fender know that it cannot fail.

You can get the Auto Cushion Fender free on your next car, if you demand it. If your dealer cannot supply you write us.

CATALOG ON REQUEST.



DEALERS
AND AGENTS
WRITE FOR TERRITORY

AUTO CUSHION FENDER COMPANY
20 West Spring Street, COLUMBUS, OHIO

AUTO CUSHION FENDER COMPANY
20 West Spring St., Columbus, Ohio
Gentlemen:—Please send me full information and
price of your Auto Cushion Fender.
Name
Address

Please mention the Automobile Dealer and Repairer when writing to advertisers.

BEWARE OF SPURIOUS MAGNETO AND COIL PARTS

The Remy Electric Company, of Anderson, Indiana, has obtained a permanent injunction restraining the

Monier Auto Supply Co., of Detroit, Michigan from selling spurious magneto and coil parts to fit old types of Remy ignition devices.

We have filed suits against,

National Motor Goods Co., of St. Louis, Mo., at St. Louis,
Chicago Auto Supply House, of Chicago, Ill., at Chicago,
Iroquois Rubber Company, of Buffalo, N. Y., at Buffalo.

The parts sold by these and other concerns are of inferior design, material and construction. They are not efficient and positively injure the magneto and coil upon which they are applied.

Other Suits Pending

We intend to fight this nefarious practice to the death and respectfully solicit your co-operation. Dealers and users are urged to purchase repair parts for old equipment from authorized Remy Branches and Service Stations, only.

REMY ELECTRIC COMPANY, ANDERSON, INDIANA

Service Stations:

Boston, Mass.	Buffalo, N. Y.	New Orleans, La.	Memphis, Tenn.
Chicago, Ill.	Savannah, Ga.	Norfolk, Va.	Milwaukee, Wis.
Detroit, Mich.	Seattle, Wash.	Louisville, Ky.	Minneapolis, Minn.
Indianapolis, Ind.	Charlotte, N. C.	Omaha, Neb.	Pittsburg, Pa.
New York City, N. Y.	Cincinnati, Ohio	Philadelphia, Pa.	Portland, Me.
Kansas City, Mo.	Cleveland, Ohio	Spokane, Wash.	Portland, Ore.
San Francisco, Cal.	Columbus, Ohio	Utica, N. Y.	Providence, R. I.
	Dallas, Texas	Grand Rapids, Mich.	Rochester, N. Y.
Albuquerque, N. M.	Denver, Colo.	Houston, Texas	San Antonio, Texas
Atlanta, Ga.	El Paso, Texas	Jacksonville, Fla.	St. Louis, Mo.
Baltimore, Md.	Nashville, Tenn.	Los Angeles, Calif.	Washington, D. C.

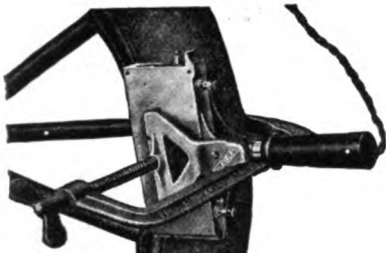
CANADA

Vancouver, B. C. Winnipeg, Man. Calgary, Alberta. Montreal, Que. Hamilton, Ont. Toronto, Ont.

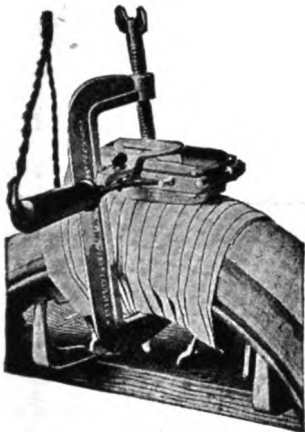
Please mention the Automobile Dealer and Repairer when writing to advertisers.



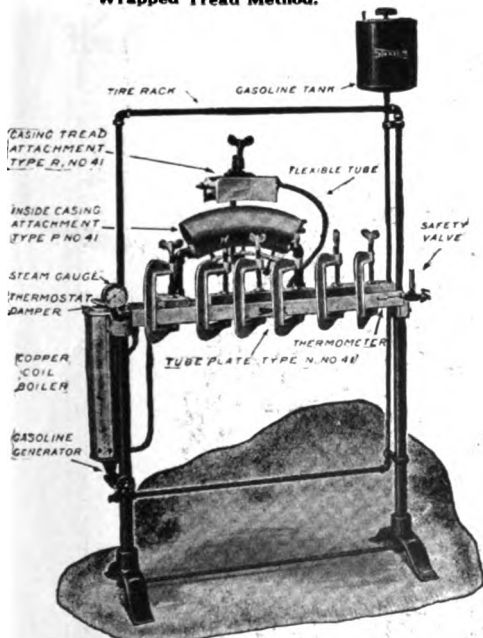
Electric Model Repairing Tube.



Vulcanizing Rim-cut.



Mending a Blowout by
Wrapped Tread Method.



Complete Steam Equipment for Garages.

There's a **SHALER** Vulcanizer for every requirement

*Made in the only exclusive vulcanizer factory
in this country.*

Used and recommended by

17 Tire Makers

68 Car Manufacturers

6,700 Garages

83,000 Motorists

Sold by all accessory dealers.

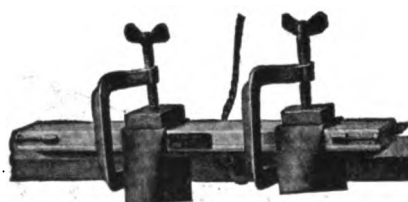
MOTORISTS:—

*You will find the Shaler Vulcanizers in the catalogues
of all the largest automobile accessory houses. We will
mail you a free copy of the famous handbook **CARE AND
REPAIR OF TIRES** if you will send us the name of the firm
from whom you buy your automobile supplies; or if you
desire, we will tell you the nearest distributor where you can
see the models suited to your own use.*

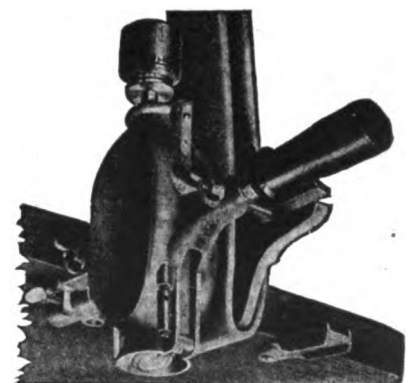
C. A. SHALER CO.

811 Fourth Street

Waupun, Wis.



"Gang" or Multi-Tube Outfit.
Mends six tubes as quickly as one.



Portable Steam Vulcanizer for Motorists.

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EDELMAANN SPECIALTIES



**No. 1
EDELMAANN
TIRE GAUGE**

Red hand remains at maximum pressure.

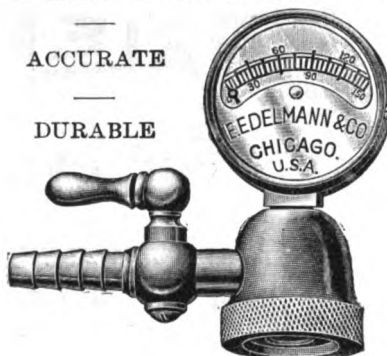
Guaranteed accurate within 2 per cent.

Price, \$1.50

No. 5 EDELMAANN GAUGE WITH SHUT-OFF

ACCURATE

DURABLE



Price, - - - - \$2.00

**No. 41 FORD
CRANK CASE
OIL GAUGE**

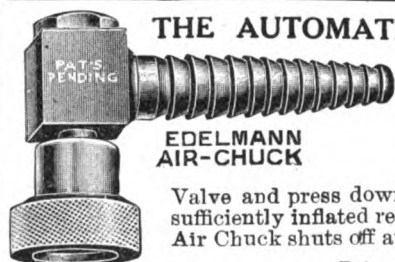
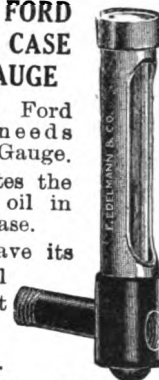
Every Ford owner needs this Oil Gauge.

Indicates the level of oil in Crank Case.

Will save its cost in oil in a short time.

Price, 50c.

Attach in place of lower Pet-Cock on Crank Case.



**THE AUTOMATIC AIR CHUCK
No. 47**

**EDELMAANN
AIR-CHUCK**

The Chuck is entirely Automatic. To operate, simply slip connection over Tire Valve and press downward. When Tire is sufficiently inflated remove from Tire Valve. Air Chuck shuts off automatically.

Price, \$1.00



GREASE CUPS

Nos. 101, 102, 103
Just right for Spring Bolts
Price, 20 Cents

Nos. 104, 110
Wherever a good Grease Cup is required
Price, 40 Cents
Send for samples.



ANY ARTICLE WILL BE SENT BY PREPAID MAIL ANYWHERE IN U. S. OR CANADA, ON RECEIPT OF PRICE.
E. EDELMAANN & COMPANY, 229 W. Illinois St., Chicago, Ill.
OUR LATEST CATALOGUE SENT ON APPLICATION. New York Agents—ASCH & COMPANY, 1779 Broadway, N. Y.

"Universal" Treads

**ADJUSTABLE
AND
DETACHABLE**

**Non-Skid
Puncture Proof**

**FIT ANY
AND ALL MAKES OF TIRES**

*A great practical lesson in Tire Economy.
A Universal money saver for the autoist.*

COST NOMINAL SERVICE PHENOMENAL

From 10,000 to 20,000 miles certain on new casings, properly inflated.

Doubles the mileage on old casings.

The "Universal" is equipped with a powerful and positive anchorage.

HOLDS TIGHT TO THE TIRE

"UNIVERSAL" tire protectors are a time-tried and proven success. Friends and customers made in the beginning, five years ago, are still with us, and we are adding new ones by the score. We are saving them all time and money. If we can do this for others, we can for YOU. Let us prove it. Send in your order today.

UNIVERSAL TIRE PROTECTOR CO.

Box 678 A, ANGOLA, INDIANA



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WILSON HURT IN AUTOMOBILE

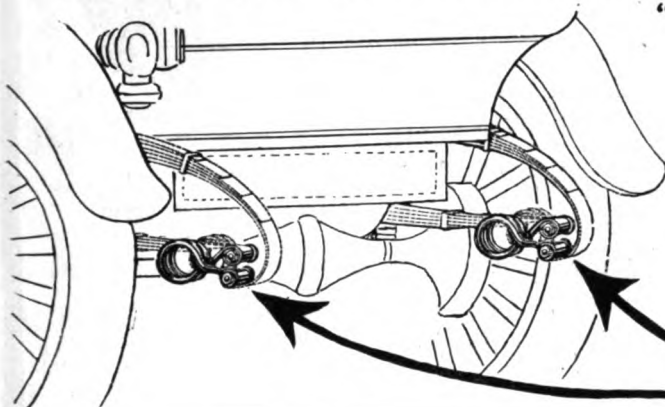
PRINCETON, N. J., Nov. 4.—Governor Woodrow Wilson attended to his correspondence today as usual, being little bothered by the scalp wound he received when his auto struck a mound in the road and jolted him against a rib in the roof of the car.

When the Governor met the correspondents he was wearing a narrow strip of collodion and gauze covering a wound three inches long. He said he would expect his assassin as he had planned.

THE JOUNCE THAT BOUNCED WILSON!

COULD HAVE BEEN PREVENTED
HAD HIS CAR BEEN
EQUIPPED WITH

ACME TORSION SPRINGS



"DON'T JOUNCE" "DON'T BOUNCE"

Insurance for life of occupants, car, and easy riding. Equip your car with Acme Torsion Springs. Don't be fooled by "shock absorbers." What you want is *more* spring capacity under proper Automatic Control. Acme Torsion Springs add at least 18 feet to the total leaf spring area, every inch adding greater resiliency *automatically controlled*.

Acme Torsion Springs stop *vibration*, prevent *spring crystallization* and *breakage*, minimize *tire* and *engine* trouble, and improve the riding qualities of any car at least 75%. They cost less than half the price of shock absorbers, and are worth several times as much.

Eliminate Vibration and you eliminate trouble. Adaptable to all types of leaf springs. Quickly and easily applied by anyone. Satisfaction guaranteed.

We have convinced thousands, let us convince you. Write to-day for information.

ACME TORSION SPRING CO.
1000 Boylston St., BOSTON, MASS.

A
Quick
Repair

Increases Mileage Cuts Tire Cost

Neglect of tires is more costly than wear. If you mend the small holes as soon as discovered you will greatly reduce your tire bills.

For repairing slits, cuts, bruises, blow-outs and punctures in casings, or in fact for permanent repairs for any injury that may happen to your tubes or casings, nothing equals an

M. & M. CEMENT-DOH OUTFIT

Sent Prepaid for \$1.25 Complete

Anyone can use an M. & M. Cement-Doh outfit.

It contains everything necessary to make a complete repair of sand pockets or casings where the carcass is exposed. The M. & M. way is much better, much cheaper, much quicker and much safer than heat vulcanizing.

If your dealer can't supply you with an M. & M. outfit, send us \$1.25 and we will forward the outfit direct to you. Your money will be returned if you are not satisfied.

Our Free Booklet
"Money Saving Facts"
will be sent to all users
of tires upon request.

The M. & M. MFG. CO.
Dept. C
Akron, Ohio



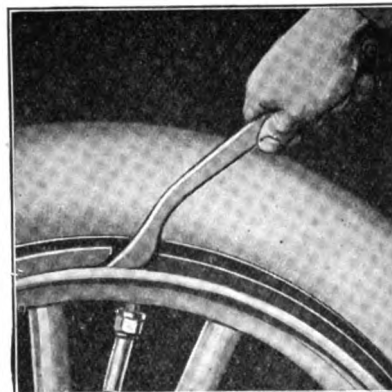
For
Every
Tire
Tear

PRICE-
COMPLETE
\$1.25

Perfection Rim Remover for Standard Universal Quick De- tachable Rims

Perfect in operation,
quick and easy.
Saves time and
temper.

You Want One

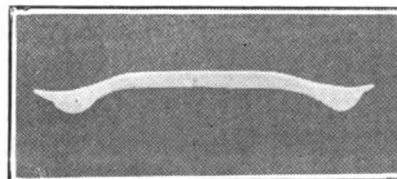


You will have urgent need for it the first time you have occasion to change a tire. Eliminates all danger of damage to tire or rim. Made of tempered steel, durable and always ready for instant use. **It's the very tool you have been looking for.**

Insert point as shown, use a downward motion and rim is released. Buy today, you may need one tomorrow.

Good proposition to Jobbers and Dealers. Write for prices.

If your Dealer cannot supply you, order direct from us. Sent post-paid to any address in the U. S. A. upon receipt of price, (\$1.00) One Dollar.

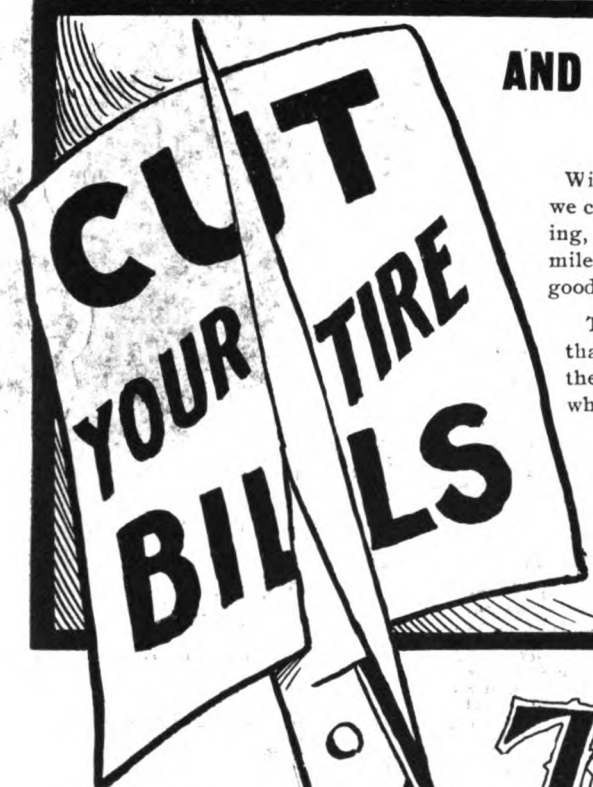


PERFECTION MANUFACTURING CO.

NEW MARTINSVILLE,
West Virginia.

Patentees and Sole
Manufacturers.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



DOUBLES
TIRE
MILEAGE

PREVENTS
PUNCTURES
AND
SKIDDING

WRITE OUR NEAREST FACTORY
FOR FULL PARTICULARS AND PRICES

AND MAKE YOUR OLD TIRES AS GOOD AS NEW

With that tread-worn tire of yours as a foundation, we can build you a puncture-proof and non-skid casing, which ought to give you from 1,000 to 2,000 miles more service than your new tires would be good for.

The secret of Triple Tread Success lies in the fact that the Triple Tread affords perfect protection to the fabric carcass and positively keeps out all water, which causes rotting. Rubber treads cannot do this—detachable rubber or leather treads cannot do it—inside linings cannot do it. **Nothing but chrome leather, vulcanized to your tires in the Triple Tread way, can do it.**

Chrome leather, re-inforced by steel studs, is the only thing tough enough, waterproof and pliable enough to make a better and more

economical tire tread than rubber. Chrome

leather is ten times

tougher than rubber, and waterproof.

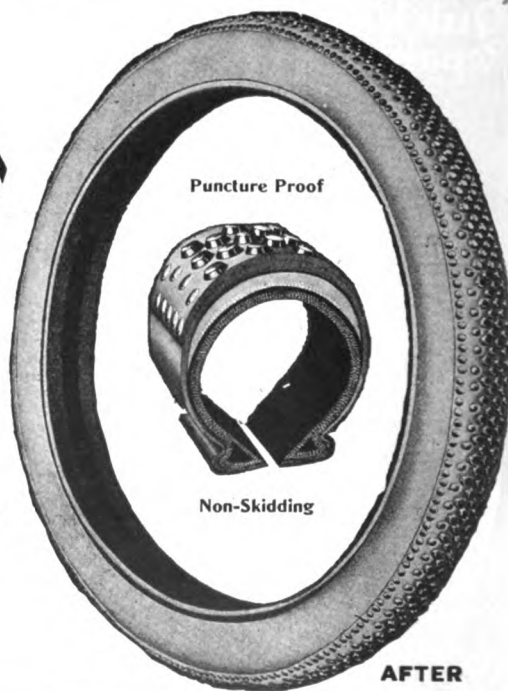


BEFORE

The
**TRIPLE
TREAD**

**PUNCTURE PROOF
SKID PROOF
GUARANTEED**

Let us Triple Tread just one of your tires now for a trial. The best time to act is while your car is laid up for the winter. Don't wait till you are ready to take the car out in the Spring.



AFTER

Triple Tread Manufacturing Co.

CHICAGO
1542 Michigan Avenue

SAN FRANCISCO
542 Van Ness Avenue

WINNIPEG
52 Gertie Street

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Will Not FREEZE

Will not injure any part of the car.

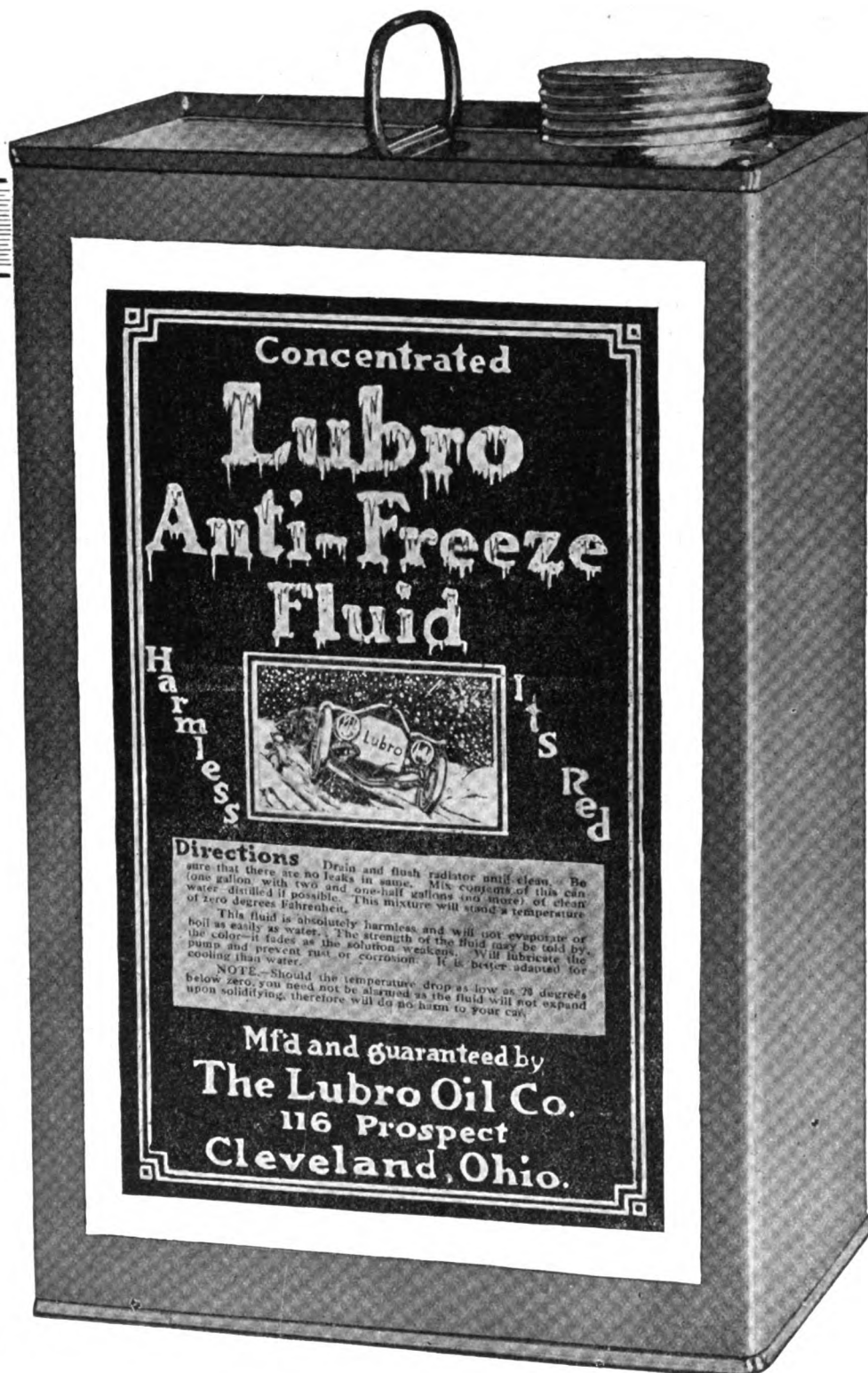
Will not evaporate or boil as easily as water.

Will lubricate the pump.

Will prevent rust and corrosion.

Better adapted for cooling purposes than water itself.

IT'S RED

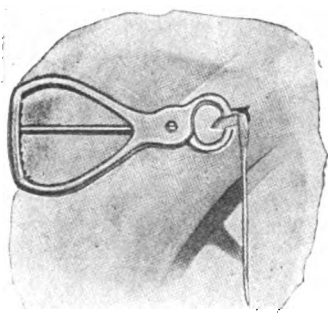


LUBRO ANTI-FREEZE FLUID is packed six one-gallon cans to a case, in five and ten-gallon jacketed cans and thirty and fifty-gallon steel drums with faucets. We will ship one gallon of LUBRO ANTI-FREEZE FLUID upon Receipt of \$1.50.

One gallon is sufficient for your radiator. One application is sufficient for the season.

1913 Trade Announcement

DO YOU realize that the *expense* of driving a car *can be reduced*? Do you realize that *upkeep expense* is the greatest drawback to the Trade and to the pleasure of driving a Car? Do you realize that 75% of upkeep expense is *unnecessary* expense? Do you believe that the Automobile Manufacturer, when figuring on new equipment, should give his whole attention to extra equipment in the line of so-called luxuries and conveniences to the *exclusion* of *accessories* for *cutting unnecessary upkeep expense*? Cutting out upkeep expense is my sole object in business—I'm not interested in luxuries. I want to know what you find to be your three greatest sources of expense about your Car. *What are they?* Isn't Tire Expense one? **GILMER TIRE REPAIR PLIERS** will remedy that. The other two will be taken care of by two accessories, which I have perfected after a great deal of expense and time. These will be exhibited at the New York Show and announced in January Trade Papers.



Pliers opened, distending cut for cleaning, tool applying gum. Ratchet in handle holds PLIERS open. (Pat.)

HERE ARE **GILMER TIRE REPAIR Pliers**

They fill a long-felt want—you can wear white gloves with no danger of soiling and you **NEEDN'T BEND OVER**. Consequently, during the next year double the amount of gum will be sold and everybody will be repairing their tires, in order to cut expense.

10,000 Miles of Service are built in every good tire made. Do yours last that long?

If you used the same hap-hazard methods in business which you use in having your car repaired and buying your supplies you would not own a Car. Just because you can afford a Car is no reason why you should buy two sets of tires to run the distance one set should.

In every instance where a tire blows out a close inspection will show that there is a small cut in the rubber envelope, which allows dirt, grease and dampness to get into the fabric and rot it.

We have a guaranteed proposition which should appeal to you. We want to refer our mail orders to Dealers as soon possible.

Price of nickel plated PLIER with combination cleaner and cotter pin hook, \$1.00.

NOTICE: If you will tell me the three biggest items in your UPKEEP EXPENSE I will send you an advanced copy of Show Announcement on these *New Expense Cutters* by mail, with a copy of *Tire Insurance*.

G. WALKER GILMER, Jr., Manufacturer, **FILBERT AND SEVENTH STS. PHILADELPHIA, PA.**

P. S.—Will be pleased to see you at Garden Show. Space No. 639.

An Insurance Policy AGAINST ACCIDENTS

TRADE MARK
Raybestos
REG. U.S. PAT. OFF.

"THE ORIGINAL AND BEST ASBESTOS BRAKE LINING"

90% of Automobile Accidents Are Due to Faulty Brakes

The efficiency of even the BEST brakes is nullified by low quality brake lining.

RAYBESTOS—the best lining—increases the efficiency of any brake.

It grips and *holds*. It *stops* the car. It wears longest and makes the car safe—it offers insurance against accident.

RAYBESTOS is made of the highest quality long-fibre asbestos woven with copper wire. Specially treated. Heat-proof. Woven evenly throughout. Gives a wall of strength to the brakes.

Insist upon getting RAYBESTOS. Avoid "cheap" imitations. We stamp the name "RAYBESTOS" in every foot of the lining. This is your guarantee that you are buying the best lining the industry produces. Ask your dealer.

The Royal Equipment Company

450 Housatonic Ave.

Bridgeport, Conn.

Don't fail to see our exhibit of Raybestos, Duplex and Raymond Brakes and Gyrex, the Mixer, at the Garden Show.



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4/5

of all the best dealers in
the country sell America's
Predominant Tires—

**United States
Tires**

As always the guarantee of the United States Tire Company attaches to its tires when filled with air at the recommended pressure only.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Prest-O-Starter

Starts your engine (old or new) quickly and easily in coldest weather

FOR FOUR CYLINDERS, \$20
FOR SIX CYLINDERS, \$25

\$1.50 extra for two-way valve necessary when the same Prest-O-Lite is used for both starting and stopping.

Here's a starter that adds practically no weight to your car, is perfectly simple and is as durable as the engine itself. Easily applied to any engine, old or new, very economical in the use of gas, and requires no expert repairing.

How Prest-O-Starter Works

The principle of starting a motor with Prest-O-Starter is the same as "starting on compression." A measure of acetylene, at low pressure, is pumped from your Prest-O-Lite into the cylinders.

Touch your spark—your engine starts.

Unlike "gasoline priming" it is not affected by heat or cold. It is certain.

In cool weather, by opening a valve on the dash, you can feed gas at low pressure into the intake manifold. This allows your engine to run on acetylene until it is warm enough to run on gasoline.

If the Prest-O-Starter did no more than prime your engine in this way during cold weather, this convenience would be well worth the price.

But Prest-O-Starter is more than a primer. When installed properly, it will start your engine, summer or winter, almost invariably without recourse to the crank.

Make Sure Your Starter is Installed CORRECTLY. Look it over!

The Prest-O-Starter is easy to install correctly. In fact, it's so very easy to install that some good factories and

garages install it with utter carelessness, overlooking the one or two simple features vital to success in operation. Fortunately this is an easy matter for the car owner to correct, even if he isn't a mechanic.

Our literature tells you exactly how the Prest-O-Starter is installed, and how to adjust it. Anyone can give it the slight attention it may need or quickly tell a dealer where the trouble lies.

Every Prest-O-Starter is sold with the assurance of satisfactory service. The entire Prest-O-Lite Organization is back of every one. If you have any trouble, report it to us or to our nearest branch. We'll wipe it out quickly.

Insist Upon GETTING the Outfit COMPLETE

During warm weather the connection which feeds acetylene into the intake manifold is not needed. So some dealers are not installing it. But in cold weather this feature is vital. You're entitled to it. It's included in the price, so see that you get it.

Now More Than Ever You Need One

Your Prest-O-Starter, properly installed, will average better than 95 starts out of 100 attempts. The few failures are caused by your motor stopping on dead center, or cylinders filled with burnt gas. Both of these conditions can be easily avoided when stopping your motor. But should either or both happen, an eighth or quarter turn of the crank, with the switch at neutral, will remedy the trouble at once, with all of the danger and labor of cranking eliminated.

Rest assured that no other starter can give you as high efficiency with as great economy, durability and freedom from mechanical trouble. The price is within easy reach.

Get in touch with any of our branches—or your dealer—or write us for descriptive literature.

The Prest-O-Lite Co.

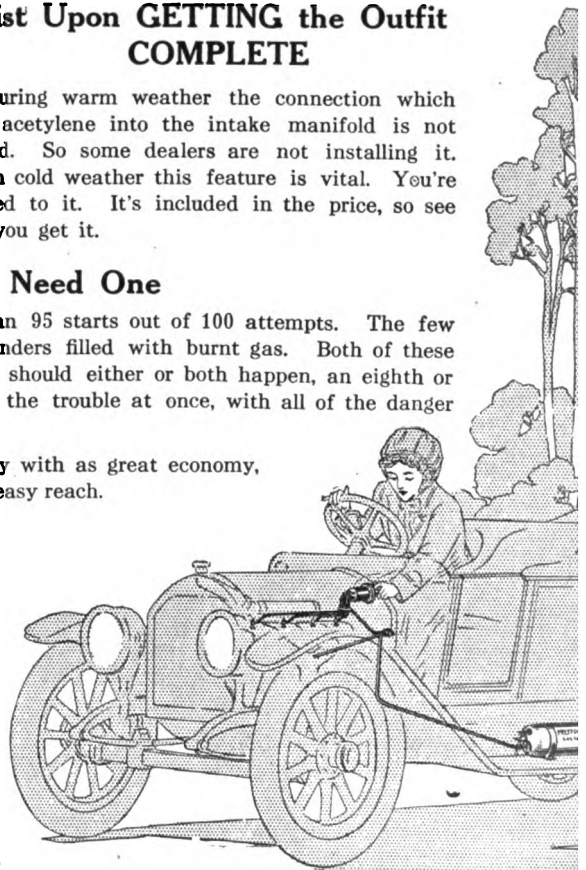
251 E. South Street

Indianapolis, Ind.

BRANCHES

Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Indianapolis, Jacksonville, Kansas City, Los Angeles, Memphis, Tenn., Milwaukee, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Ore., Providence, St. Louis, St. Paul, Minn., San Antonio, San Francisco, Seattle, Syracuse, Merrittton, Ont., Toronto, Ont., Winnipeg, Manitoba.

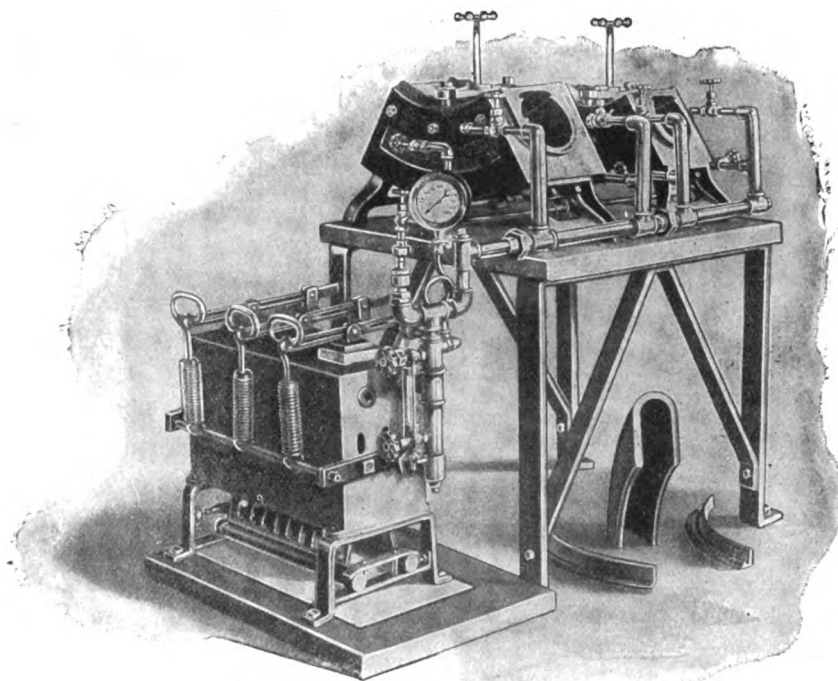
Exchange Agencies Everywhere.



Please mention the Automobile Dealer and Repairer when writing to advertisers.

Forty Million Dollars For Tire Repairs

The 1,200,000 cars in use in 1913 will necessitate spending at least \$40,000,000.00 per year for tire repairs. At least six million tires will be used. Every 200 cars will produce at least \$6,000.00 worth of this business which carries an average profit of 40%.



No. 5. EQUIPMENT FOR GAS OR GASOLINE.

We have many other outfits, both self steam generating and for an independent boiler.

YOU OUGHT TO SHARE IN THE PROFITS. Install an Akron-Williams outfit, the kind used and recommended by twenty-seven out of thirty tire makers and by successful repair men everywhere. Ask your tire maker about us.

IT DOESN'T TAKE MUCH MONEY to buy the best plant and you can make more with it than with an investment four times as large in any other line. We have outfits from \$40.00 to \$1000.00, depending upon how much and what range of work is to be handled. Every outfit is standard.

GET INTO THIS PROFITABLE BUSINESS NOW.

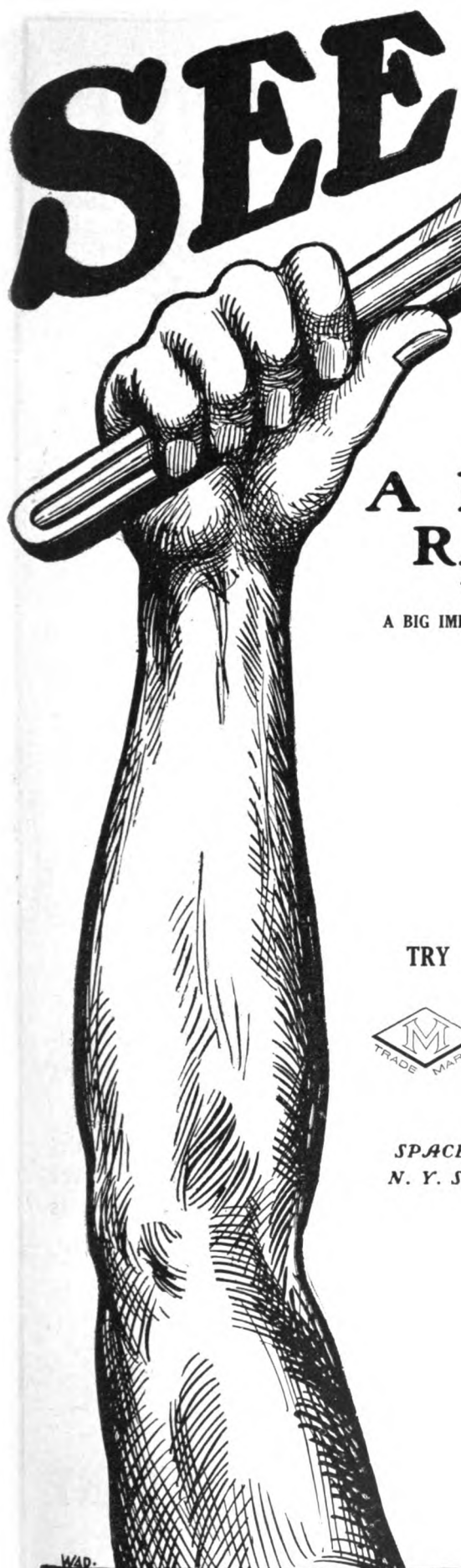
Write Today for Catalogue 121.

"IF IT IS USED TO REPAIR TIRES, WE MAKE IT."

THE WILLIAMS FOUNDRY & MACHINE COMPANY

GLENDAL AVENUE - - AKRON, OHIO

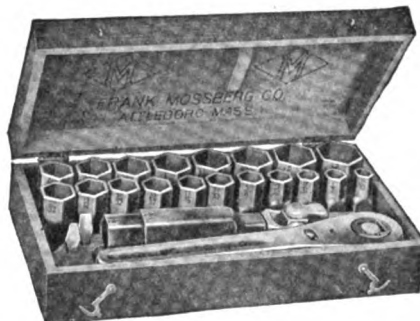
SEE THIS!



A NEW AND BETTER RACHET WRENCH

THAN YOU HAVE EVER USED

A BIG IMPROVEMENT OVER THE PREVIOUS SOCKET-WRENCH HANDLES



*Why not send for catalog
No. 143 and be shown?*

TRY OUR UNIVERSAL AUTOMOBILE SET No. 10

ILLUSTRATED HERewith



MOSSBERG

ATTLEBORO, MASS.



SPACE 638
N. Y. SHOW



Please mention the Automobile Dealer and Repairer when writing to advertisers.

INTERLOCKS

Double Your Mileage

Prevent Blow-Outs and Punctures Save Half Your Tire Expense

If you really believed this you would order a set of Interlocks for your car at once. We can prove our statements if you will give us the opportunity. Thousands of car owners are discarding inner shoes, reliners, fillers, extra treads and other makeshifts for Interlock Inner Tires with the most satisfactory results. A set of new tires equipped with Interlocks will carry your car an entire season without tire trouble. That's a big statement, but we can prove it.

What Interlocks Are Interlock Inner Tires are complete endless inner tires (not inner shoes) quickly and easily placed between the outer casing and the inner tube. They strengthen the outer case and protect the inner tube from punctures. The patented Interlock Flaps lock the Interlock securely making it an integral part of the whole tire that flexes perfectly and cannot chafe, creep or heat. Interlock Inner Tires will hold even if the outer casing is broken, and can be used in old or new tires. They double the mileage of new tires and add 1,000 to 5,000 extra miles to old ones. Interlocks have a fine gray rubber finish, are smooth outside and inside and have no troublesome ends, joints or edges to cement. Interlocks do not affect the resilience of your tires—are easy to insert and can easily be removed from one tire and replaced in another.

Proved Best by Road Tests Interlock Inner Tires are the only tire reinforcement that has stood the exacting test of hard road work. Eight tires equipped with Interlocks have made over 7,000 miles each, a total of 56,000 miles, without a blow-out or any tire trouble. Interlocks used in tires that have gone 10,000 miles with the outer casings worn clear through have kept up with fast cars equipped with new tires and carrying extra tires. Interlocks have made a 4,500 mile cross country run—the last 1,000 miles over 20 mountain ranges without a blow-out or even carrying an extra tire. In the Four States Run Interlocks stood the test of hard fast road work under the critical observation of tire experts, without tire trouble. These and other hard public tests have proved the efficiency of Interlock Inner Tires beyond question.

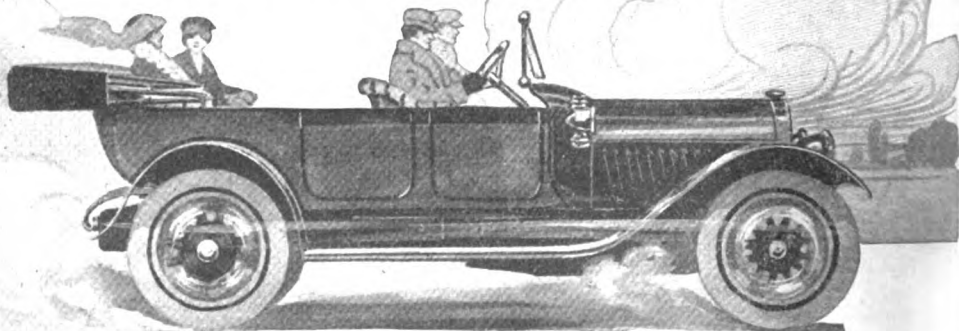
90% Of All Tires Are Scrapped Before The Rubber Tread is Half Worn Out

because the fabric is not strong enough to resist hard road work, resulting in blow-outs, punctures, rim cuts, etc. The liberal excess fabric strength of tires equipped with Interlocks prevents blow-outs, punctures, etc., gives extreme long mileage, safety, and that freedom from tire trouble which every car owner desires.

Are You Open to Conviction?

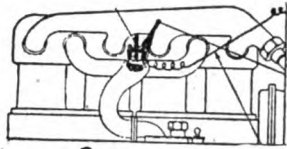
Send us your address on a post card and let us mail you our booklets, data and testimonials of users which are very convincing. Interlocks are sold by the best dealers everywhere. Ask your dealer about them. See our exhibits at New York, Chicago and Boston Shows.

Double Fabric Tire Co.
18 W. 9th Street Auburn, Ind.

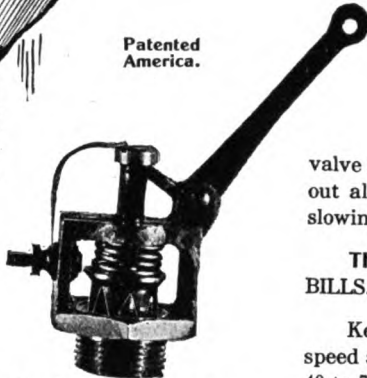




SPEED



Patented America.



Showing Valve When Open

Patented Europe.



Showing Valve Closed

WITH ECONOMY AND SAFETY

TRY THE M & M ECONOMIZER at OUR RISK for THIRTY DAYS

The M & M is a nickel-plated device, which is inserted in the manifold. It is made with one valve and six portholes, for **speed and power** and cutting out all ignition and gasoline while going down grades, slowing up for crossings, and turning corners.

THE M & M is a saver of brakes and those **BIG TIRE BILLS**.

Keeps the engine cool at all times. Will increase your speed and power 20%. A saver of 40 to 50% on gasoline and 40 to 50% on carbon. Acts as a safety valve in case of a back-fire. Can also be used for priming the engine.

The M & M ECONOMIZER

Is the only known carburetor adjuster on the market. Do not throw your old carburetor away until you have applied our device. **THEN NOTICE RESULTS.** Requires but a few minutes to attach. Can be installed to all cars. Requires but a $\frac{1}{4}$ " pipe tap to insert.

PRICE of the M & M COMPLETE, Including Friction Pedal, \$3.50 f. o. b. Philadelphia.

Can be sent by mail for 17 cents extra for postage.

Money refunded in thirty days if not satisfactory. So far we have had no "come-backs," which is the best proof of its value.

When ordering by mail, kindly enclose check or money order. Send the coupon to us at once.

Also Made For MOTORCYCLES.

Our motorcycle attachment requires a $\frac{1}{4}$ " pipe tap to insert into manifold. It is nickel-plated, highly polished, and absolutely airtight.

It can also be used on automobiles.

It is guaranteed to increase your speed at least 20%, with a saver of 40 to 50% of gasoline and also less carbon.

PRICE OF OUR MOTORCYCLE DEVICE, \$1.25, Prepaid.

Write for our latest catalogue, which contains valuable information for all motorists.

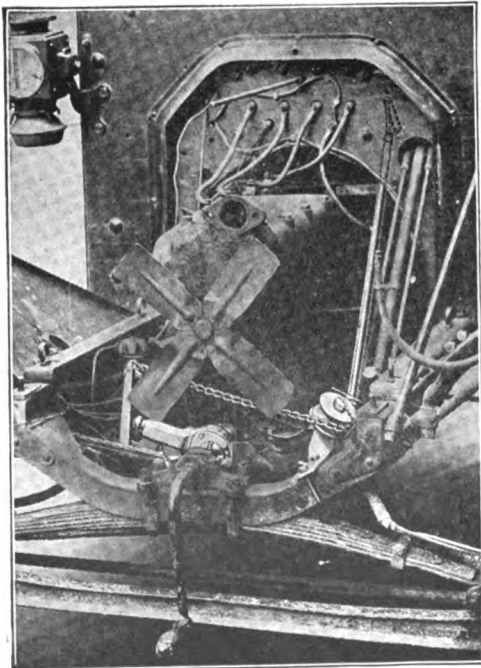
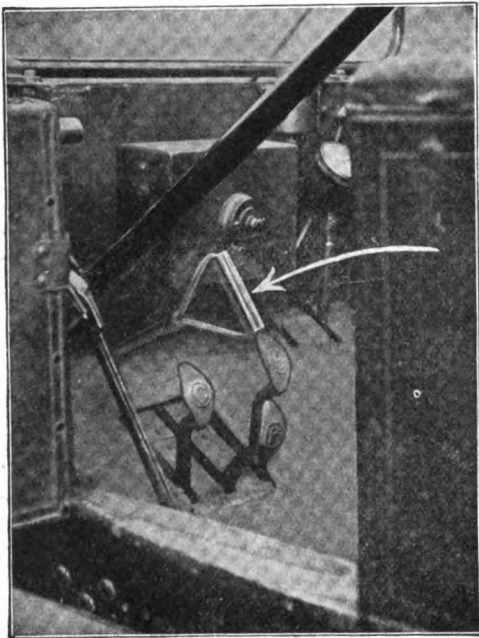
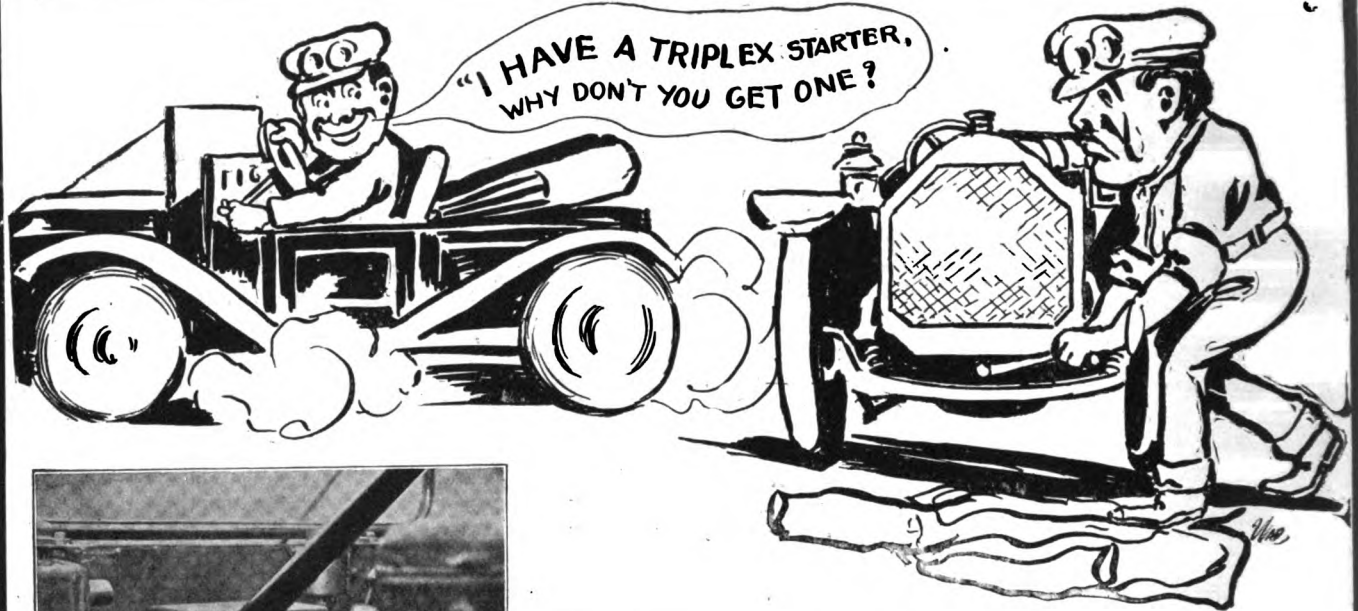
MOLLER BROS. CONTROLLER & ECONOMIZER CO.

AMERICAN OFFICES

700 Betz Building, PHILADELPHIA, PA.

MOLLER BROS. CONTROLLER & ECONOMIZER CO. PHILADELPHIA, PA.
Enclosed find \$3.50 for which send us one of your M & M Economizers, to be returned in thirty days if not satisfactory.
NAME.....
ADDRESS.....

Please mention the Automobile Dealer and Repairer when writing to advertisers.



The Triplex STARTER

FOR FORD ENGINES

"It is out of sight," under the hood. All that shows is a small hand lever on dash.

You do not have to leave your seat to start your Ford Motor when equipped with the **TRIPLEX STARTER**.

All that is necessary is to pull the lever. Will positively turn your motor over every time.

The **TRIPLEX FORD ENGINE STARTER** is a mechanical starter, which, of all types—compressed air, acetylene gas, electric and spring—is the only one on the market which at all times proves absolutely **RELIABLE**. In no respect is it a "Hit-or-Miss" proposition—working one minute and short circuiting or blowing out a cylinder head the next. It gives 100% uninterrupted service from the time it is attached. It comprises so few parts and is so simple and direct in application that it cannot get out of order, and it is as safe and durable as it is simple and effective.

With the **TRIPLEX STARTER** you have two starting devices. You do not remove the crank. It stays on.

"Ask the man that has one." To be had at all dealers or direct on receipt of price.

DEALERS:—It doesn't require **SALESMANSHIP** to sell an **ARTICLE** for which every **FORD OWNER** is clamoring. Bring the **TRIPLEX FORD ENGINE STARTER AND THE FORD OWNER** together and a sale results.

Big Sales spell Big Profits. Get our Sales Proposition today. Write or Wire. No more broken arms. Back kicks are dangerous.

PRICE, \$11.50.

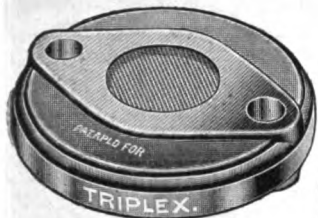
Write Department 10.

BREMER-WILSON MANUFACTURING CO.

1256 MICHIGAN AVE., CHICAGO, ILL.

Western Representatives, **AUSTERMELL and HANSON**, 560 Phelan Bldg., San Francisco, Cal.

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The Triplex GUARANTEE

The Triplex finishes the work the carburetor leaves half done.
The Triplex makes imperfect carburetion a mechanical impossibility.

Sixty Day Trial Proposition.

The Triplex is guaranteed to decrease fuel consumption 25%, increase power, prevent carbonization, prevent Back Firing, effect easy starting.

The Triplex will increase mileage, promote flexibility.

The Triplex will equalize the most uneven mixture that leaves the carburetor—make it uniform throughout.

The Triplex utilizes every drop of gasoline to its full capacity, making a saving of over 25% per gallon. It gives you five gallons of fuel at a cost of four. It makes high-grade gasoline out of low.

INSURE YOUR CAR Against Fire By Using a Triplex.

A back fire is impossible with a TRIPLEX, due to the fact that any flame is cut off before it reaches the raw

fuel in the carburetor. Fire cannot pass through a TRIPLEX. The principle is the same as the non-explosive feature of the miner's gauze lamp.

The Triplex makes starting easier regardless of temperature or atmospheric conditions, and stops suction of live gasoline when the motor is cold.

The Triplex increases power proportionately. The full cylinder charge is ignited every time—the maximum power delivered at the point of highest efficiency. Because there is no fuel waste, there is no power waste. A TRIPLEX is a double economy—it INCREASES power at the same time it DECREASES fuel consumption.

The Triplex can be readily attached by anyone in one-half hour's time.

The Triplex is sold with the understanding that if it does not do as we claim we will gladly refund your money at the end of sixty days.

90 %
OF THE AUTOMOBILES
DESTROYED BY FIRE
ARE CAUSED BY A
BACK FIRE IGNITING
THE RAW GASOLINE
IN THE CARBURETOR

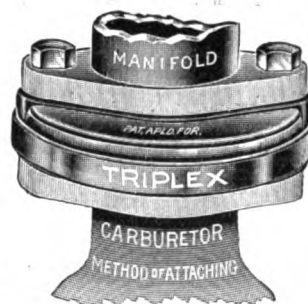
PRICES

1 in., \$3.50	1 1/4 in., \$5.00
1 1/4 in., 4.00	2 in., 5.50
1 1/2 in., 4.50	2 1/2 in., 6.00

In ordering Give MODEL, H. P.,
and Make of Car.

To be had at all dealers, or direct
on receipt of price.

DEALERS—Here is one of the fastest
selling devices on the market. Every
motorist has got to have one. Big
sales spell big profit. Write or Wire
Today for our Sales Proposition.



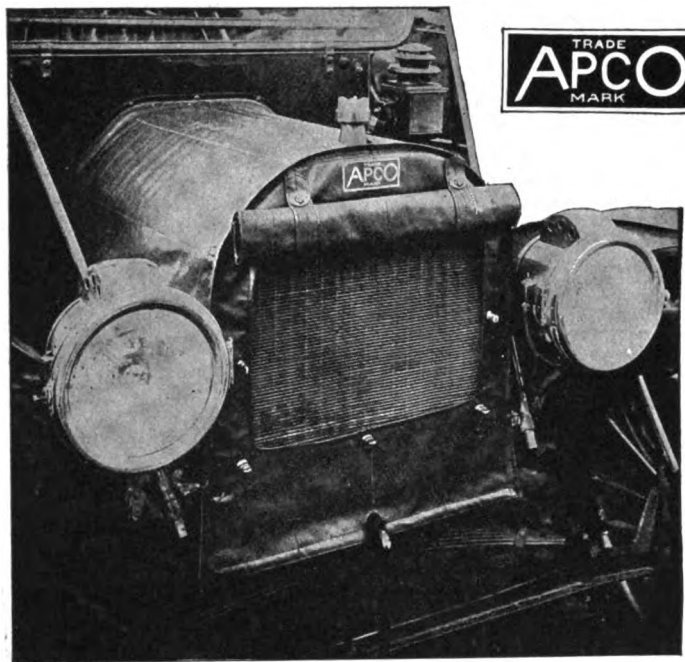
WRITE DEPT. 10.

BREMER-WILSON MANUFACTURING CO.
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WESTERN REPRESENTATIVES
AUSTERMELL AND HANSON
560 PHELAN BLDG. SAN FRANCISCO, CAL.

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FORD OWNERS



FORD HOOD COVER

This is one of the best winter specialties we have ever offered and it cannot help but meet with the approval of the Ford owners.

The cover is made from rubber cloth, well stitched and padded with felt.

It completely envelops the hood and radiator.

It keeps in the heat, working on the same principle as a "fireless cooker" or a "vacuum bottle."

With one of these covers on, your car will not cool off over night and therefore it will start without trouble in the morning.

It is absolutely waterproof and it can be left on the hood all winter, protecting the engine from rain and sleet as well as the cold.

When running the front curtain should be fastened up and let down when car is standing.

PRICE \$6.00 EACH

Prepaid on Receipt of Price.

Our 1913 Free Catalog is Ready

40 Specialties for Ford Car Owners
AUTO PARTS COMPANY

Providence, R. I.

THE AVON PATCH

SEVEN PLY
12 in.—14 in. Long.



3	.....	\$1.00
3½	.....	1.25
4	.....	1.50
4½	.....	1.75
5	.....	2.00

BUILT LIKE A BRIDGE.

LIMITED INTRODUCTORY OFFER

To introduce the AVON BLOW-OUT PATCH we will send absolutely free, postage prepaid, any one of these articles with each AVON Patch ordered.

1 Can Clutch Compound.....50c.	1 Box Cementless Patches.....75c.	1½ Pint Aluminum Paint.....50c.
1 Rubber Putty Outfit.....75c.	1 Pint Rubber Cement.....50c.	1 Pair Rubber Goggles.....75c.

Give Size of Tire and Check Article Wanted.

IF GRAY MAKES IT—GRAY GUARANTEES IT

GRAY SPECIALTY CO., - - - NEWARK, N. J.

ELECTRIC STAR AUTO HEAD-LIGHTS AND TAIL LAMPS.

The lamp that has no rivets or solder and only one screw used in its construction. It is cast of silvered aluminum, the interior highly polished, which does not tarnish. Convex lenses which are laid in rubber to make them water and dustproof, and the strongest lamp made. Write for catalog. Mfd. by MILWAUKEE BRONZE CASTING CO., 142 Clinton St., Milwaukee, Wis.



STYLE E

NEW SYSTEM

GEAR CLUTCH VALVE LESS
1500 Lb. DELIVERY WAGONS
 Correspondence Solicited.
KEARNS MOTOR CAR CO.
 1179 Broadway, New York. Factory, Beavertown, Pa.

Ride on Air—Laugh at Punctures
SEALO TIRE TREATMENT
 Seals Punctures Instantly While You Ride
 Sealco Tire Co., 1411 Michigan Ave., Chicago, Ill.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

The Atwater Kent System



Magneto Gear Mounting for installing the Atwater Kent System in place of magneto.



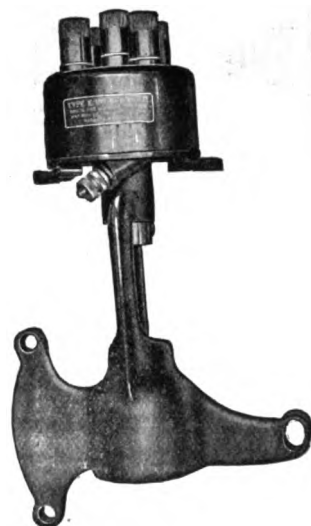
For 2-Cylinder Maxwell Cars Prior to 1909 Models.



For 1905, 1906, 1907 Models Franklin Cars.



For 2-Cylinder Buick Cars Prior to 1909 Models.



For Ford Cars, Model T, also 1911, 1912 and 1913.

has been on the market for the past seven years, during which time over seventy-five thousand have been used with universal satisfaction and the demand is steadily growing among discriminating car owners who require the best ignition obtainable.

The Atwater Kent System embodies the best features of both magneto and battery—in fact, it gives magneto results with a battery system without the weaknesses of either, at less than one-half the cost of a good magneto.

The Atwater Kent System can be easily installed on any standard make of motor, new or old, by substituting the Unisarker for the regular timer on the timer shaft of the engine. To meet a large demand for its use on cars where it is impossible to place the Unisarker directly on the timer shaft, such as the various model Fords, Franklins, 2-cylinder Buicks and Maxwells, we have designed special gears and brackets which enable the installation to be easily and quickly made with little or no machine work. During the past season we have furnished several thousand of these equipments, enabling the owners of the above cars to have an ignition system equal to that found in the highest-priced car.

Due to the steadily increasing demand for the Atwater Kent Ignition System we have increased our manufacturing facilities, enabling us to manufacture this equipment in such quantities that the cost of efficient factory operation can be reduced to the minimum, and we herewith announce to the trade and the motoring public the following reductions in price of our Type F system.

Prices of the Type F Atwater Kent Ignition System

	Standard Coil Box	Kick Switch Coil Box
1-cylinder.....	\$17.00	.....
2-cylinder opposed.....	18.00	.....
2-cylinder distributor type.....	22.00	\$24.00
3-cylinder.....	25.00	27.00
4-cylinder.....	25.00	27.00
6-cylinder.....	27.00	29.00

The price of the different gear sets illustrated herewith is \$3.00 each in addition to the above prices.

In substituting the Atwater Kent System for the magneto, a special magneto gear mounting is required, illustrated herewith, the price of which is \$5.00 in addition to the above prices.

When you install the Atwater Kent, you do not need an expert and will not have to worry about your ignition. You can be sure it will get out of your motor all the speed and flexibility the maker put into it and that it will last as long as the motor.

Perhaps your present car only needs an Atwater Kent Ignition System to enable it to give you perfect service—anyhow you should have a copy of our booklet "G," full of ignition facts—it's interesting and it's free.

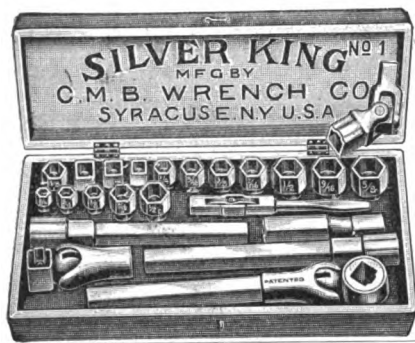
ATWATER KENT MFG. WORKS

4933 Stenton Avenue, PHILADELPHIA.



For Ford Models N, R and S.

"SILVER KING"



We are adding a universal joint to our No. 1 "SILVER KING" and our No. 1 "AUTO QUEEN." "SILVER KING" also has a T with a ball joint which can be used as an adjustable handle socket wrench, and the adjustable handle on the ratchet wrench head, together with the Universal Joint, one can get in difficult places where no other wrench can be used.

Jobbers, ask for Electros and Price.

C-M-B Wrench Company
908 1/2 E. Genesee St., Syracuse, N. Y.

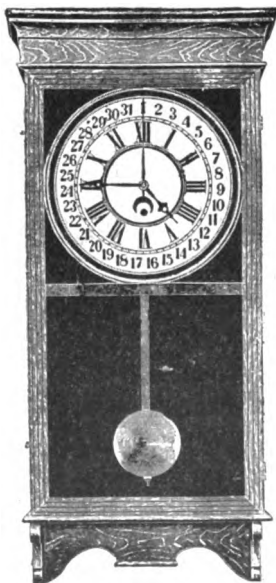
Automobile Wheels and Motor Truck Wheels



Wheels repaired and returned by express same day.
Try us.

THE EBERLY & ORRIS MFG. CO.
Mechanicsburg, Pa.

Every Repair Shop or Garage SHOULD HAVE A CLOCK.



We have recently made very favorable arrangements with one of the largest clock companies in this country by which we are enabled to offer to our readers a **Regulator Eight Day Calendar Clock**, 88 1/2 inches high, with a 12 inch dial, finished in oak or hand-rubbed Mahogany, with a subscription to the **Automobile Dealer and Repairer** for one year, at the very low rate of \$3.90.

We cannot fill orders for these clocks for foreign countries.

Every repair shop, garage or dealer's office should have one of these clocks. It will give you the time of day correctly and the day of the month.

The engraving shown gives the correct appearance of this clock.

This offer is good for either old or new subscribers.
Remittances can be made in any convenient way. Be sure to state whether you want this clock in Oak or Hand-Rubbed Mahogany.

Address all orders to

THE MOTOR VEHICLE PUBLISHING CO.,
Publishers of THE AUTOMOBILE DEALER AND REPAIRER,
71-73 Murray Street, NEW YORK.

HARRIS

TRADE MARK—REG. U.S. PAT. OFF.

OILS

THEY
WILL
MEAN



TO
YOUR
MACHINE

MORE MILEAGE—because they're ALL lubricant—no waste.

LESS EXPENSE—because they give greatest mileage per gallon.

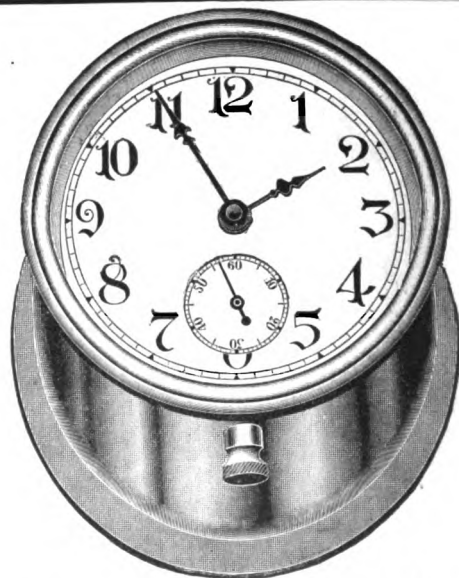
GREATER EFFICIENCY—because there are no ingredients to harm the engine.

INCREASED POWER—because all frictional parts are properly lubricated—that's what HARRIS OILS will mean to your machine.

Don't Fail to See Harris Oils at the Show
Space 161 (Elevated Platform) at the Garden

A. W. HARRIS OIL COMPANY

326 S. Water St., Providence, R. I. 143 No. Wabash Ave., Chicago, Ill.



Do you want a motor clock

For your car, and a good one?

The clock illustrated in this connection is manufactured by one of the most reliable clock companies in the country and is warranted in every respect.

It is not liable to get out of order.

It has interchangeable parts.

It is the product of skilled labor combined with the most improved Waltham Automatic Machines.

The arrangement we have made enables us to furnish one of these clocks and a **subscription to the Automobile Dealer and Repairer** for a year for the precise price that the clock retails for, namely, **\$2.50.**

The clock can safely be sent by mail and will be forwarded postage prepaid to any part of the country. Remittances can be made in any convenient way. Address

MOTOR VEHICLE PUBLISHING CO.

71-73 Murray St.

New York, N. Y.



Winter Lubrication

If you plan to keep your car in service through the cold weather you especially need



because it is impervious to change in low temperature. It lubricates as perfectly at zero as in warm weather.



If you are planning to house your car for the winter, it will pay you to clean out all the bearings and gears, and repack them with NON-FLUID OIL. This lubricant does not dry or gum when the car is idle and will not cause the slightest corrosion of balls and rollers. NON-FLUID OIL excludes moisture and prevents rust.



Ask your dealer for "K-000" NON-FLUID OIL for grease cups, differential, universal joints, etc., and K-00 special grade for your transmission.

Look for above Trade Mark

New York & New Jersey
LUBRICANT

165 Broadway, New York

CHICAGO, 1430 Michigan Avenue

PHILADELPHIA, 1431 Vine Street

Pacific Coast Distributors, HUGHSON & MERTON

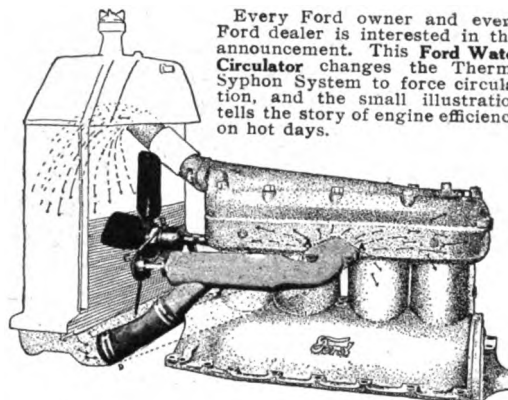
San Francisco

Portland

Los Angeles

Seattle

Ford Dealers & Owners Read This—Then Act



Every Ford owner and every Ford dealer is interested in this announcement. This Ford Water Circulator changes the Thermo Syphon System to force circulation, and the small illustration tells the story of engine efficiency on hot days.

The Ford Water Circulator

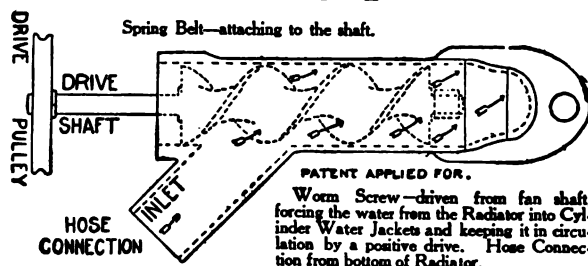
forces the water through the cylinder water jacket by the positive drive of the worm screw, insuring rapid circulation with mechanical pressure back of it, giving

A Cool Motor Always

The Ford water circulator can be installed in twenty minutes without boring or reaming. The worm screw shaft is driven off a split pulley on the fan shaft through a spring belt that snaps on in an instant.

Always in motion when engine is running—practically no excess power required to drive—does not impede circulation when motor is at rest.

"FURNISH FORD OWNERS WITH THIS COOLING SYSTEM"



It saves engine wear and tear, promotes speed—saves repairs—economizes on oil—prevents carbon—comes to you ready to install—weighs but three pounds—cast aluminum.

Here is a
\$2.50
Coupon
For You

PRICE \$12.50

Our Proposition Through the Jobber
Will Interest Live Wire Dealers

The Fulton-McCutchan Company

1146 Michigan Avenue

Chicago, Ill.

Mr. Dealer and Mr. Jobber:

This coupon entitles the signers to a rebate of \$2.50 on the purchase price of a Ford Water Circulator. We stand behind it.

THE FULTON-McCUTCHAN COMPANY

147 Michigan Ave., Chicago, Ill.

Ford Owners
30 Days Only

Name.....
Address.....

Please mention the Automobile Dealer and Repairer when writing to advertisers.



JOBBER DEALERS MOTORISTS

Get YOUR HANDS on our 1913 catalog.
YOU want our proposition.

WRITE TO-DAY.

WHY? Because we know how to produce the **BEST** enamels, air drying and baking, at the **RIGHT** prices. We can serve you from New York, Minneapolis or San Francisco.

NEMO HARD RUBBER AIR DRYING ENAMELS

are better, go further and last longer than all others. Guaranteed not to flake or peel off from heat. Will air dry quickly and to a bone hardness. Equally as good as baked enamel finish. Semi-gloss and gloss black.

LIST PRICES	
Half Pints.....	\$0.60
Pints.....	1.10
Quarts.....	\$2.00
½ Gallon.....	3.50

NEMO Radiator Cement

Don't take a chance and have your motor ruined from loss of water for cooling, nor use inferior compounds that will clog the circulating system.

NEMO is guaranteed, a tablespoonful will do the trick. Stop the leak in a moment.

LIST PRICES.	
Packages.....	.60 cents and \$1.00

NEMO Leather Enamels

Refinish your weather worn leather or Pantasote top and seat cushions. It dries over night. Softens and preserves the material.

LIST PRICES	
Pints.....	\$0.60
Quarts.....	1.10
½ Gallons.....	\$2.00
Gallons.....	3.50

NEMO Mohair Waterproofing

Refinish and waterproof your old, shabby mohair top. Why let the rain pour through and wet your hat? Dries in a few hours and makes the old look new.

LIST PRICES	
Pints.....	\$1.10
Quarts.....	\$2.00
½ Gallons....	\$3.50

NEMO Cylinder Enamels

Dead black, gloss black, and auto gray. Will not crack from heat or hot oil splashes.

LIST PRICES	
Half Pints.....	\$0.60
Pints.....	1.10
Quarts.....	\$2.00
½ Gallons.....	3.50

NEMO Valve Grinding Compounds

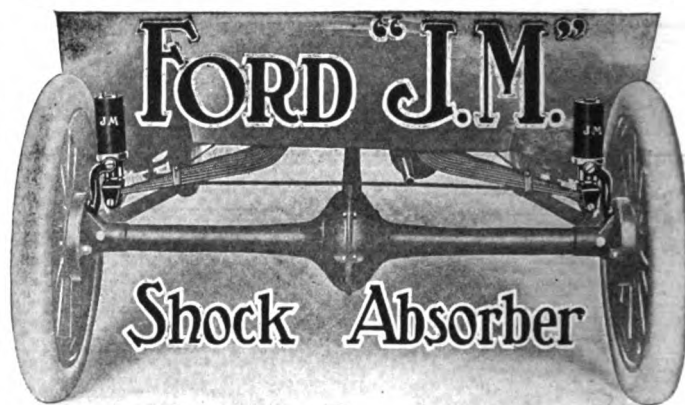
Prepared in flexible tubes like tooth paste.

YOU will benefit by asking us for information. We are glad to give it. Completely illustrated catalogue free. Write for it to-day.

OUR INTERESTS ARE MUTUAL.

We will teach you how to use our products.

NEMO Chemical & Paint Mfg. Co.
MINNEAPOLIS, MINN. U.S.A.



makes it possible for the Ford Car owner to enjoy the same luxurious ease and comfort that the highest-priced car gives.

By serving as a perfect auxiliary to the springs, by avoiding all tendency to lock or arrest their action, the **Ford J. M. Shock Absorbers** give an added riding comfort never before possible.

By holding the rear wheels to the ground, they insure continuous traction and cut down wear and tear on tires and car.

Booklet "V" tells why thirty-five dollars invested in **Ford J. M. Shock Absorbers** makes your Ford Car the equal in riding qualities of a five-thousand-dollar one. Write for it *to-day*.

See the J. M. at the Madison Square Garden Show, Basement, Space 658.

The J. M. Shock Absorber Co.

Main Office and Factory

210 South 17th Street,

Philadelphia, Pa.

NEW YORK, N. Y., 218 W. 84th St.
CHICAGO, ILL., 1509 Michigan Ave.
BOSTON, MASS., 222 Eliot St.
BUFFALO, N. Y., Teck Building
ROCHESTER, N. Y., 111 Monroe Ave.
HARTFORD, Conn., 230 Main St.
CLEVELAND, O., 5906 Euclid Ave.
PAWTUCKET, R. I., 41 Dexter St.
ST. LOUIS.

DETROIT, MICH., 1001 Woodward Ave.
PITTSBURGH, PA., 5919 Baum St.
ATLANTIC CITY, N. J., 12 S. Virginia Ave.
BALTIMORE, MD., 10 W. Eager St.
WASHINGTON, D. C., 1803 M St., N. W.
LOS ANGELES, CAL., 1256 S. Flower St.
SAN FRANCISCO, CAL., Van Ness Ave. and Jackson St.
SEATTLE.

Branches in France, England, Germany, Russia, Belgium, Australia, Italy, Spain, Argentine Republic, South Africa and Australia.

AUTOMOBILE SPECIALTY IDEAS WANTED—
Get in touch with us if you have invented some specialty and are seeking a market.



Please mention the Automobile Dealer and Repairer when writing to advertisers.

LEE TIRES

Spell "T-R-A-D-E C-O-O-P-E-R-A-T-I-O-N"

The Lee Tire line has a straight line drive.

This tire proposition meets so thoroughly the needs of every car owner that it creates more power than any other—and applies that power right at your shop, Mr. Dealer.

The man who would give his soul to avoid punctures—and there are myriads of them—finds the remedy in the

LEE Puncture-Proof PNEUMATIC TIRES

which have averaged over 6000 miles under hardest truck service, without a single puncture or inner-tube replacement. Without the Lee you drive that man to makeshifts, that cannot give resiliency, service or satisfaction.

The man who wants a standard price tire, which is better made, of finer rubber and stronger fabric, needs Lee Tires. What other tire maker puts you in position to guarantee that all his tires are cured by the correct, up-to-date process?

The careful driver who wants tire service, without "tire mileage insurance," can save 20% by using Lee Tires—standard in everything but specified mileage, sold factory perfect. You avoid troublesome mileage adjustments and make sales you would otherwise lose.

All Lee Tires—regular and puncture-proof—are made either with regular tread, or the new Lee Non-Skid Tread—that's another advantage for you.

The Lee Advertising

is as good as the Lee line—the tire ad's with the "L" have created such demand that we have had to add repeatedly to our facilities this past year.

If you want this selling power applied right at your door, write for our new dealer's co-operation plan "I" and further details on our 1913 advertising schedule, which is reaching practically every auto owner in America.

OUR STORES

835 Seventh Avenue, New York City
1233 Michigan Avenue, Chicago

225 North Broad Street, Philadelphia
3567 Lindell Boulevard, St. Louis.

103 Massachusetts Avenue, Boston

Pacific Coast Distributors: Chanlor & Lyon Co., San Francisco, Los Angeles, Seattle, Fresno, Portland, Ore.

KELLY-FIELD CO., 1737 BROADWAY, NEW YORK CITY
General Sales Agents for Lee Tires and Tire Accessories

CHAS. F. U. KELLY, Formerly President Kelly-Racine Co.

HARRY E. FIELD, Formerly Vice-President and Sales Manager Hartford Rubber Works Co.

SEE US AT MADISON SQUARE GARDEN SHOW, Space 253 Balcony

LEE TIRE & RUBBER CO.
CONSHOHOCKEN, PA.
J. Ellwood Lee, President

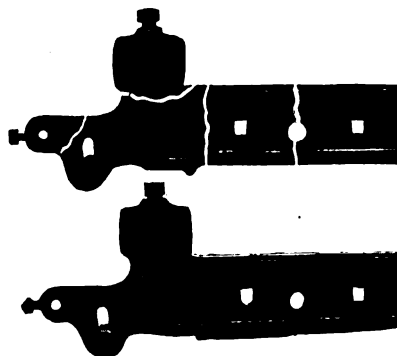


Automobile Repairs

Send that difficult job to us.
If we can't do it, nobody can.

ELECTRIC and OXY-ACETYLENE WELDING OF ALL BROKEN PARTS

Aluminum Cases and Cracked Cylinders Welded.

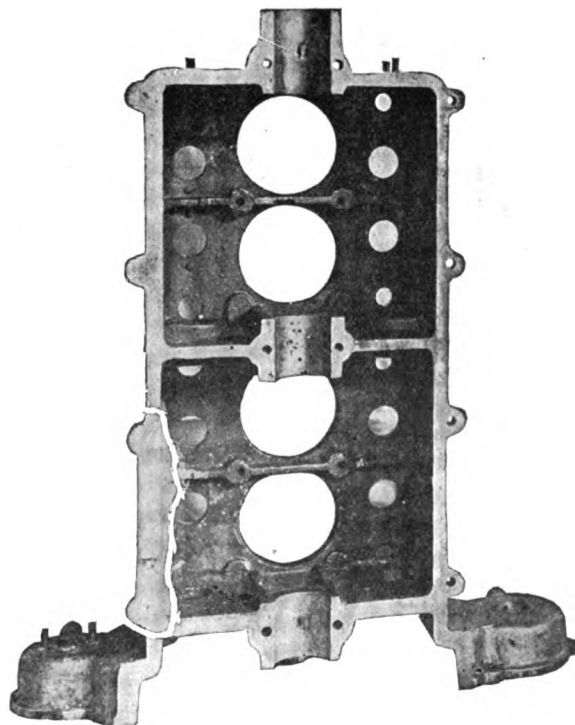


CAST IRON.

Transmission Cases, Intake and Exhaust Pipes, Broken Chassis re-enforced and welded.

We also design and build special machinery and do a General Repair business.

All Work Absolutely Guaranteed.



ALUMINUM CORE.

SEND FOR OUR LITTLE BOOKLET.

THE HUB MACHINE, WELDING & CONTRACTING CO.
22nd and Race Streets Philadelphia, Pa.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Vulcan Inner Tubes

Are made honestly and well, of "long," gummy stock, and will not crack or become brittle. These tubes have made a friend of every user of them, because of their sterling quality and worth. Reasonably priced for a high-grade inner tube.

Vulcan Inner Casings

Completely envelop the inner tube. They add strength to a casing, and will keep in service one which without the *Inner Casing* would have to be thrown away. *Made "Full-Round"* so as to reinforce the casing at every point. The highest grade of tire reinforcement on the market.

Tire Reliners, Blow-Out Patches, Tire-Pads

Are produced in several grades by this company. Full value given in every grade.

The Vulcan Line

has pleased hundreds of the most enterprising jobbers and dealers throughout the country.

Prompt Shipments

Reasonable Prices

Good Values

Your Inquiries are Invited

VULCAN RUBBER COMPANY

Erie, Penna., U. S. A.

MAYO SPARK PLUG TIRE PUMP

Start the season Right

with a thoroughly reliable power pump in your tool box. One which may be depended upon in every emergency to give fully efficient service and save time, hard work, and your tires. Thousands were released from the drudgery of hand pumping last year. Now is the time for you to make arrangements to motor in comfort this season.

Anybody can use it with SURE RESULTS

SIMPLY REMOVE A SPARK PLUG from any convenient cylinder and substitute pump (with the hands only) is the advantageous method of attaching to all motors. After connecting the hose from the pump to the tire, the motor should be started and run on low throttle from two to four minutes until the tire has been inflated to the pressure desired. A half-inch plumber's valve or pet-cock may be installed permanently in one of the engine cylinders, making it unnecessary to remove a spark plug each time in using. The pump inflates the tire with nothing but **PURE, FRESH AIR**, is noiseless in operation, non-adjustable, requires no attention whatever other than an occasional drop of oil, and works equally well on all sized cars from the smallest Ford to the largest Lozier.

GUARANTEED and INDESTRUCTIBLE

OUR DESIGN MAKES THIS PUMP ABSOLUTELY INDESTRUCTIBLE. The pumping piston only operates when motor is run on low throttle and automatically locks when the engine is raced; again operating when the throttle is lowered. An article that is small, light, compact, weighing only two and one-half pounds, which may be carried anywhere—always in working order and ready for use.

Try it on your own car free before purchasing.

Furnished complete and ready for use with bushing to fit any car, and 12 feet hose and connections (Pressure Register \$2.00 extra)

\$10.⁰⁰

MAYO MANUFACTURING CO., Manufacturers,

59 E. 18th Street,

..

..

CHICAGO, ILL.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

LEAK-PROOF Piston Rings



If you are not using "Leak-Proof"—you are not using the better ring.

"Leak-Proof" RINGS are not the lowest priced rings you can buy but they are positively the best, and will prove cheaper in the long run.

Why experiment with the cheaper and inferior rings when you can buy "Leak-Proof" RINGS, that can always be depended upon?

The tens of thousands of "Leak-Proof" RINGS in use and giving satisfaction are testimonials of their efficiency. We want to reach those

who are not using the "Leak-Proof" RINGS. Users know the benefits they are receiving.

To save money—to increase power—to decrease carbonizing—to save fuel—that is why tens of thousands of "Leak-Proof" PISTON RINGS are in use to-day.

BRANCH OFFICES

NEW YORK
H. P. MARSH,
625 Lenox Avenue.

PITTSBURGH
J. W. McKEEN,
7620 Tioga Street.

KANSAS CITY
CHAS. E. ECKHARD,
3123 Michigan Avenue.

SAN FRANCISCO
WM. B. GODFREY, 288 Market Street.

CHICAGO
H. G. PARO,
Suite 39, 106 N. La Salle St.

LOS ANGELES
WM. H. STEELE,
822 Central Building.

FORT WORTH, TEX.
E. S. MOBERLEY,
108 Bryan Avenue

McQuay-Norris Manufacturing Co.
1313 Chestnut Street ST. LOUIS, MO.

HORSEY

"THAT'S THE NAME"



For Inside of Casings

The HORSEY NO-CEMENT INNER LINERS are made of 4 to 5 layers of rubber and cotton tire fabric for reinforcing automobile tires (inside) between tube and casing. It is made and cured to the correct form and size of inside of tire, of sufficient length so that ends lap when put in place. The side that goes against tire is specially coated and treated with a vulcanizing cement compound that when applied will adhere firmly **without the use of Cement**. The side next to tube is plain uncoated fabric and will not stick to the tube. A great protection against punctures and blowouts, and will add miles to the life of your tires.

A tire protector of merit and quality. The **heaviest** and **strongest** Inner Liner on the market. Will not **creep** or **injure** inner tube. The best tire insurance at low cost.

PRICES OF A FEW SIZES

32x3½, \$5.05. 34x4, \$6.00. 36x4½, \$7.40.

Other sizes in proportion.

HORSEY NO-CEMENT PATCH

Self-Vulcanizing.



"ONE MINUTE REPAIR"
Investigate

Remember "Horsey," That's the Name.
Large Kit—box contains 12 assorted (large and small) patches, \$1.00.

Small Kit—box contains 8 assorted (small) patches, 50 cents.

Manufactured exclusively by

The Horsey Manufacturing Company,
6104 Euclid Avenue,
CLEVELAND, OHIO.

"ALL

The one
SPARK PLUG
that gives
Perfect
Satisfaction

—
POWERFUL
SOOTLESS
DURABLE

—
PERFECT
IGNITION

—
FITS ANY
ENGINE

We shall prosecute
vigorously all infringe-
ments now on the mar-
ket, or any which may
spring up in the future.

-IN-



Plug
and
Priming
Cup

ONE"

Prime your motor
instantly

To clean the con-
tact points, you sim-
ply pour gasoline into
the priming cup and
the carbon deposit is
blown out into the
air at each discharge
of the motor.

A \$1.50 now will
save you trouble and
expense in future.

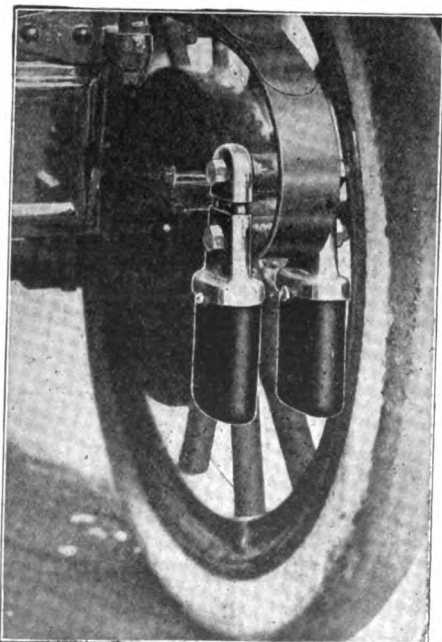
Frontier Specialty Company

732 Main St.

BUFFALO, N. Y., U. S. A.

IMPROVED VELVET SHOCK-ABSORBING SPRINGS

See Us at New York Madison Square Garden Show,
Booth No. 231, Balcony



Remember that all auto manu-
facturers must make their springs
strong enough to carry a heavy
load and that with a light load
the car *must* ride hard over rough
roads.

Velvet Springs are resilient
Shackles or links and *compel*
your car to ride easy over rough-
est roads and cobblestones.

They absorb all jolts. They will lengthen
the life of the car and save the wear on
the car and tires. Can be attached in a few
minutes. They allow no side sway. No fittings
necessary. *Strong, durable, cannot twist out of
shape.*

Write us—Giving name and weight of car; width of rear
springs, and size of spring bolts. Sold for cash, or 15 days
trial.

A Few Agencies are Still Open—Write us

JOHN W. BLACKLEDGE MFG. CO.

2210 Michigan Avenue

Chicago, Ill.



"Riding on Air"

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Making Model Motors 18 Years

For these many years Model Motors have given perfect service in every kind of machine which could possibly utilize gasoline engine power.

MODEL MOTORS HAVE PROVEN SUCCESSFUL in everything from the modern motor car to a railway locomotive. They are today used in motor cars, tractors, plows, commercial vehicles, locomotives and machinery of all kinds.

WE KNOW HOW TO MAKE a gasoline motor. We do not work on theories but from absolute facts, gathered from our long experience.

WE HAVE FOUND HOW to produce a motor that will afford the greatest power, with the least weight; a motor that will outwear any car; a motor that is easy started and controlled; a motor that will increase the efficiency of your car.

AND THAT, MR. MANUFACTURER, is what we offer

you. If you equip your car with a Model Motor, you have brought that point up to the greatest possible efficiency. You have the best motor that can be made when you consider real service.

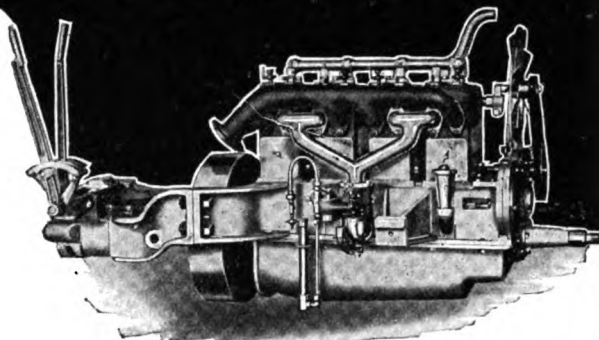
MODEL MOTORS have the punch! What is a big load for the ordinary motor is mere play for the Model. This great pulling power, reliability, and ease of control are features which you should consider for your car.

OR, IF YOU ARE planning a new car and wish a special motor, send

us your blue prints and we will draw up special designs, which will be exactly what your car will need.

MODEL MOTORS are used on a large number of good cars. We offer special service to manufacturers of motor cars—and our products must appeal to you if you wish to make your car as efficient as possible.

Remember we do nothing but make motors and power units—and we've been doing that for 18 years. Write us about your motor problem.



MODEL GAS ENGINE WORKS

PERU, IND.

ANOTHER GREAT BARGAIN SALE!! NEW Automobiles and Auto Trucks!!

New High Grade 2½-3 TON TRUCKS

We have a limited number of high grade 2½-3 ton trucks, equipped with 50 h. p. motor, valves in the head, Bosch magneto, Timken axles and bearings. Front wheels 34x5, rear 34x3½, double tires on rear; length of body, inside of standard, 12 ft. 2 in.; width of body, inside of standard, 5 ft. 6 in.; wheelbase, 115 inches. Steering column vertical. There is no better truck made. They are all equipped with stake bodies and ready to be put into immediate service. Regular value is \$3,500.

OUR PRICE, \$1,950.

A FEW HIGH GRADE NEW 1912 CARS

New 1912 high grade Automobiles made by one of the best, most reliable American manufacturers. ROADSTERS, TOY TONNEAUS, 5 AND 7 PASSENGER TOURING, AT

One-Half Regular Price.

Remember the great sale we had a few weeks ago when we sold 98 cars in 10 days, and as this lot is smaller we would suggest immediate action if you want to buy a new car at half price. By special agreement with the manufacturers we cannot publicly give name, but they are on our sales floors ready for delivery.

DISCO SELF STARTERS. Reliable, convenient and at our prices inexpensive. Regularly \$40 and \$80.

NOW SELLING IN THE ORIGINAL BOXES AT \$7.50 and \$10.00.

Easily attached to any make four or six cylinder car.

GREAT SNAPS IN USED CARS

PACKARDS '08, '09, '10.....	\$750, \$1,250
PIERCE-ARROW 6-66, 1910.....	\$1,450
PEERLESS TOURING, Fore-door, 5 and 7 passenger, 1909 and '10.....	\$850, \$850
STEARNS, 1910.....	\$750
OLDS, 1911.....	\$725
RAINIER, like new.....	\$800
LOCO, 40 H. P., 1910.....	\$775
CHALMERS, Fore-door, 1911 and 1912.....	\$600, \$700
MARION, like new.....	\$650
CADILLAC, 1910 and '11.....	\$400, \$650
MERCER RUNABOUT.....	\$850
OAKLAND ROADSTER.....	\$500
FORDS.....	\$150, \$250
HUPPS.....	\$200, \$300
RENAULT CHASSIS.....	\$350

100 Other Bargains. TIME PAYMENTS IF DESIRED.

All Late Models Overhauled and Guaranteed as Represented.

AUTOMOBILE ACCESSORIES

We make a specialty of buying out factories and secure large quantities of tires, magnetos, motors, repair kits, tire holders, rims, tool boxes, lamps, shock absorbers, horns, spark plugs, tops, generators, carburetors, windshields, speedometers, Presto tanks, in fact everything to make up a complete automobile.

BODIES, new and used\$45 to \$100
TIRES AND TUBES. New live goods. Positively 50c. on the dollar.
TOPS, new goods.....\$15 to \$30
LAMPS—Headlights, \$4.50, \$5 and \$9 per pair. Side and Tail Lamps, \$1.25
GENERATORS, worth \$15, now.....\$1.50
CARBURETORS, \$2.50 up, acc. to size

WINDSHIELDS, all sizes.....\$10 and \$12
MAGNETOS, all makes, \$12.50, \$22, \$30
SPEEDOMETERS, Stand, make, \$6.50
DORIAN RIM, per set (2 extras), \$12
PRESTO LIGHT TANKS.....\$13.50
ELECTRIC HORNS.....\$4.75 up
MOTORS, FRAMES, RADIATORS and 1,000 other articles for the automobile.

NO MATTER WHAT YOU ARE LOOKING FOR WE ARE SURE TO HAVE IT, and at a price less than 1-3 of what you can get it elsewhere.

TIMES SQUARE AUTO CO.

Largest Dealers in the World in New and Used Cars.

TELEPHONE, 7366-COLUMBUS.

1710-1718 BROADWAY, 54th ST., N.Y.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



AUTOLINE
TRADE MARK
OIL

THE OIL THAT MAKES GOOD!
At your dealer. If not write direct
Wm. C. Robinson & Son Co.
Baltimore, U.S.A.



The WATRES Power Whistle is operated by burned gas from the engine stored in a small reservoir to which the whistle is connected. A touch of the foot pedal operates the whistle and the blast echoes a mile ahead.

Operated by stored power, the WATRES signal is always available. Coasting down hill or around corners or even with car stopped, the power is there—ready for a touch on the pedal.

We sell the WATRES Whistle on a definite guarantee—satisfaction or money back after thirty days' trial.

Send at once for Booklet giving full particulars and price.

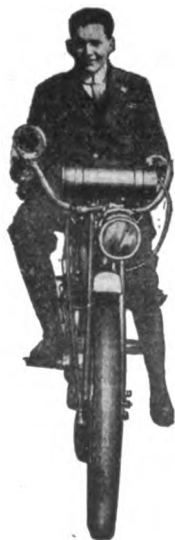
THE H. E. BOUCHER MANFG. CO.
DISTRIBUTORS

20 Fulton Street, New York.

We also make above equipment for motor boats. Send for special booklet.

Extra Income for Automobile Dealers

"Prest-O-Lite (Motorcycle Size) is the ONLY practical light for motorcycles. It is the only one that makes night riding pleasant and SAFE."



Prest-O-Lite advertising is carrying this message to the motorcycle owners everywhere and building up big business for automobile dealers as well as motorcycle dealers both on installation and exchange.

This is a new and big opportunity—and it is getting bigger every day. There's a good profit in the sale of Prest-O-Lite to motorcyclists and a steady source of income from the exchange business.

Put out a sign, "Prest-O-Lite for Motorcycles."

Our Liberal Loan Proposition applies also to the motorcycle size and makes it easy for you to have plenty on hand, with only a little money invested.

Write us about this.

THE PREST-O-LITE COMPANY, 251 East South Street, Indianapolis, Ind.

Branch Offices and Service Stations in all principal cities. Charging Plants in all parts of the country.
Extensive foreign service.

Exchange Agencies Everywhere.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

"The Chain That Lasts"



"BEST" TRACTION CHAINS

Still putting out the same quality.

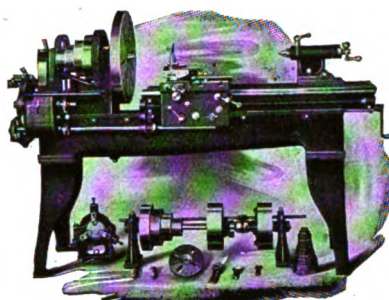
Glad to tell you "Why" "they last."

H. E. McLain and Co.

162 Pond Street

Natick, Mass.

Our New 14-24" Sliding Extension Gap-Lathe



This Lathe swings 14 1/4 in. over top bed, 24 in. through gap, and the gap opens 18 in. and 36 in. wide. Has 2-15/16 in. spindle with 1-9/16 in. hole thru same. Six quick changes of Geared Feeds, four Step Cone of large diameters.

The 5 1/2 ft. bed takes up to 54 in. between centers, while our 7 1/2 ft. machine takes 96 in. between centers when extended.

Just the thing for garage and repair work, and saves investing in a large expensive lathe.

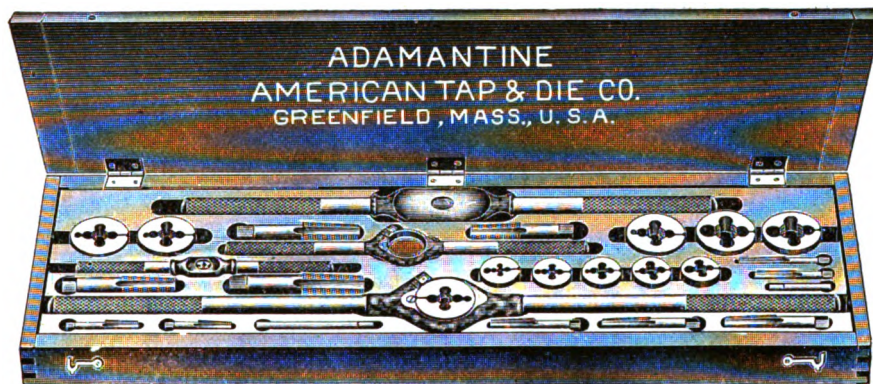
Machine is built strong, rigid and accurate, and can be furnished with taper attachment.

Write for Latest Bulletin and Attractive Prices.

Barnes Drill Co., Inc., 1907,
Builders of the All Geared Drill.

818 Chestnut St.,
Rockford, Ill., U. S. A.

Automobile Garage Sets "Adamantine" Screw Plates

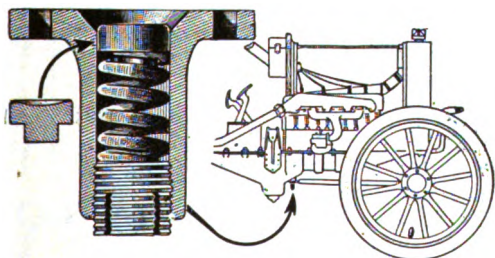


This Double Stocked Plate, Cutting Eleven Sizes, 1/4 to 1", **\$18.75** Prepaid.

A. L. A. M., U. S. or V. Standard

Send for Our Threading Tool Catalogue.

American Tap & Die Co. - Greenfield, Mass., U. S. A.



Special
for
Model T
Ford
Owners

Does Your Front Axle Radius Rod Rattle?

Send for circular of our New Anti-Rattling Spring Ball Socket, which will prevent this and ensure your axle radius rod against breakage.

ATLANTIC MACHINE COMPANY

MANUFACTURERS OF VERTICAL TIMER BRACKETS

963 Atlantic Ave.

BROOKLYN, N. Y.

J. & B. Master Vibrator } For Ford
Light Controller } Cars
Light Regulator }

Our products have made a reputation for us by our motto:

"Satisfaction or Money Refunded"

J. & B. MFG. SALES CO.

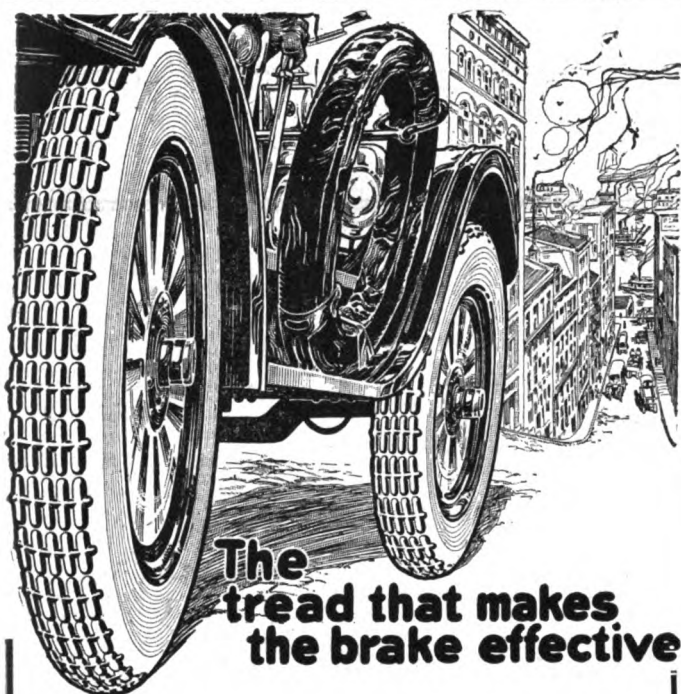
Mfrs. of Ignition Specialties

1777 BROADWAY

NEW YORK

Send for Descriptive Catalogue

Please mention the Automobile Dealer and Repairer when writing to advertisers.



When a steep grade and a slippery street join hands in beckoning a skid your brakes need help. The place to apply the help is in the tread of your tires. You want harmony between brake and tread and friction between tread and road.

"All the 'brakes' are with you" when your car is equipped with

Goodrich SAFETY TREAD Tires

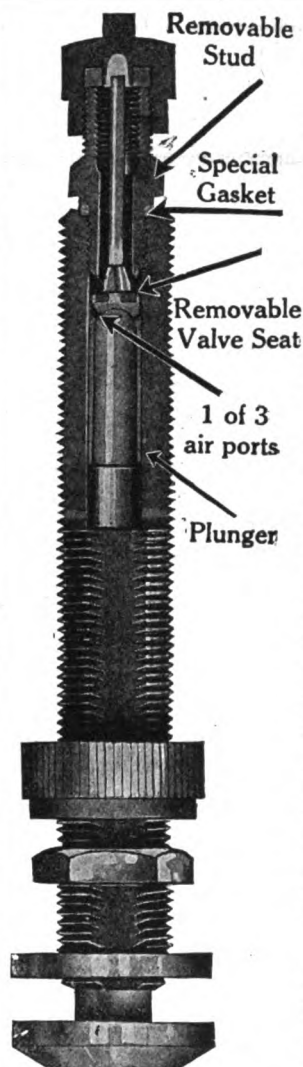
"Best in the Short Stop"

Put brakes in your tread. The bars get right down through the ooze and scrape an acquaintance with the road itself. The first bar pushes the ooze out of the way and keeps it away, while the other bars grip the clean spot under the tire.

The safety tread solves the skid by removing the cause. It is a Goodrich tire thru and thru. It has Goodrich Quality, Goodrich Unit Construction and Goodrich Tough Tread—only more of it. It delivers mileage in Goodrich heaping measure.

100 branches and service stations and innumerable dealers, everywhere, can now supply you with this new Safety Tread in any size and to fit any rim.

The B. F. Goodrich Company, Akron, O.
Largest in the World.



BURKE TIRE VALVES

cut off two-thirds the time
and labor of tire pumping

LABOR SAVING. When you inflate a 34x4 tire having Burke Valves you do away with *two tons* extra work now wasted on old-style spring closed valves. All because Burke Valves have *no spring resistance* whatever, to the charging pressure.

TIME SAVING. Burke Valves have three times the capacity to transmit air from pump to inner tube. They inflate or deflate in one-third the time.

ECONOMICAL. The stud or end section (the part most liable to injury) can be removed and a new one substituted, saving time and the expense of a new valve.

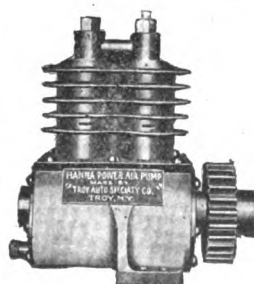
STANDARD and UNIVERSAL. Burke Valves are standard as to size and their interior parts fit every other Burke Valve, no matter what size.

DEMAND BURKE VALVES. If your dealer does not carry them, write us for booklet and we will see that you are supplied.

SPECIAL OFFER

Mail one dollar and we will send 1 set of four No. 338 Burke Valves for 3½ to 6 in. tubes, including 2 extra studs and plungers.

THE BURKE VALVE CO.
233 The Arcade CLEVELAND, OHIO



CADILLAC PUMP

This pump made especially for 1913 Cadillac Cars.

Metal Pistons with Cast Iron Piston Rings on each.

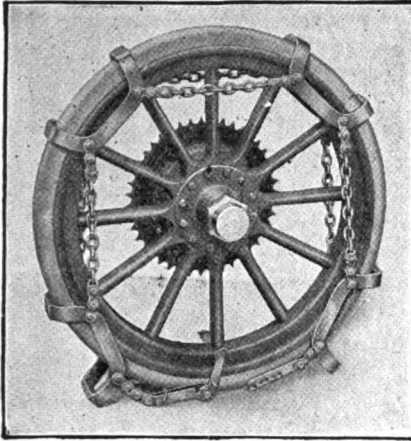
Aluminum crank case.

Anyone can attach it.

Write for Circular To-day

TROY AUTO SPECIALTY CO.
TROY, N. Y.

Subscribe to the "Automobile Dealer and Repairer," \$1.00 Per Year.



FEDERAL GRIPS

are designed and made expressly for solid tires—the more severe the conditions, the greater their merit stands out.

FEDERAL Grips are time savers, being quick attachable in every sense of the word. Jack or special tools not required in application of grips—your hands and two minutes are needed—that's all.

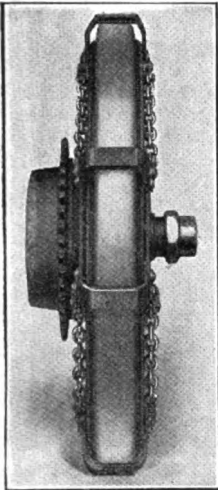
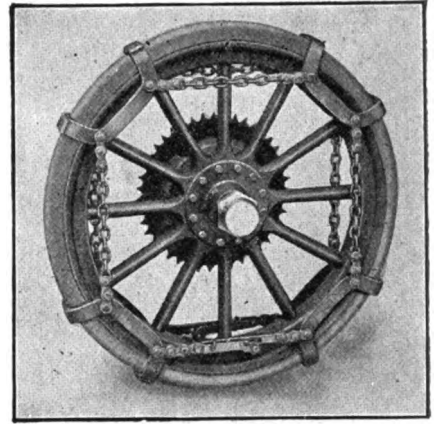
FEDERAL Grips fold up in a very compact form when not in use—they can be conveniently carried on the car, ready for any emergency.

FEDERAL Grips are made from NICKEL STEEL exclusively, the steel being heat-

treated in the most approved manner, making it capable of withstanding more than the ordinary amount of accidental or customary hard usage.

FEDERAL Grips will do the work—not injure the tires—and are mechanically perfect—our guarantee that goes with every set covers that.

As the LARGEST makers of Traction Grips for Solid Tires in the United States, we are justified in stating that our grips *must* be the best, our methods *must* reflect honesty and fair dealing, and our prices *must* represent true economy to the users.



WANTED.

ONE live, wideawake, financially responsible man in each locality to look after our interests.

THIS man may secure our "Dealer's Contract" with exclusive territory rights having NOW an established value—ever increasing with the continued production of Commercial Vehicles.

We advise filing application PROMPTLY.

"Points about Traction Grips and their selection" are covered in our catalog—YOUR copy is ready—it's free.

We also manufacture GAYLOR Grips, for Dual Solid tires.

**FEDERAL CHAIN
AND MFG. CO.**
SPRINGFIELD, MASS.

"THE LIGHT UNIVERSAL"

**"In exchange for your empty tank,
accept only a genuine Prest-O-Lite"**

This is the message that is going to Prest-O-Lite users everywhere. In it there is a hint for the wise dealer, as well.

You know that no imitator of Prest-O-Lite has ever successfully imitated Prest-O-Lite Service.

You also know that no imitator ever made good the large claim "more gas and better gas than Prest-O-Lite."

So does your customer.

Imitations are getting harder and harder to sell. There are now mighty few dealers trying it.

Most of those who yielded to the old but ever tempting claim, "More Profits," have come back home.

To the dealer who is still trying to force imitations on people who won't have them,

perhaps because he has money tied up in them, we can only say:

"The sooner you resume earning your good old Prest-O-Lite profit, the sooner you will make your income what it used to be."

The Prest-O-Lite Company, 251 East South St.
Indianapolis, Ind.

Branch offices and Service Stations in all principal cities.
Charging Plants in all parts of the country.
Extensive foreign service.

EXCHANGE AGENCIES EVERYWHERE



**HAVE
ELECTRIC
LIGHTS**

The Great White Ray
of an Electric Headlight is your safeguard when driving at night. More than this it is the thing that makes night driving a pleasure. Electric Lighting is more than lamps. It is knowing how to make lamps plus practical knowledge of electricity. Guide Lamps give you a great white ray because we have the necessary combination of knowledge and experience.

**1913
Guide
Electric Headlights**

Are as up-to-date as 1913 cars

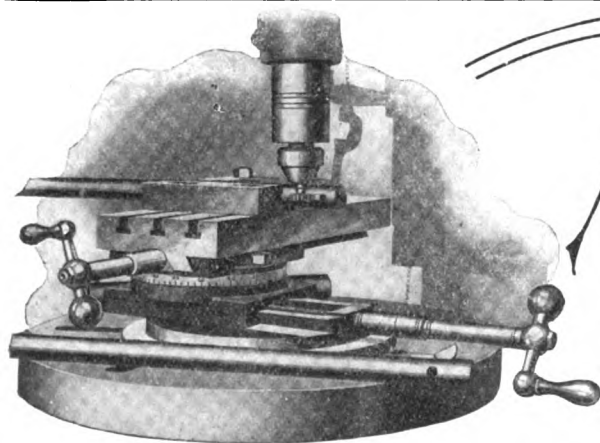
The GUIDE MOTOR LAMP MFG. COMPANY
2069 East 4th Street, Cleveland, Ohio



Guide Book No. 6 will surely interest you

Mail us this coupon

Guide Lamps will be displayed at Madison Square Garden, at the booth of CHAS. E. MILLER



"The Davis" Milling Attachment and Compound Table

JUST WHAT YOU'VE BEEN LOOKING FOR.

The "Davis" Milling Attachment can be attached to any upright drill press of any size from 14" to 42" swing, in two minutes' time. It enables you to convert your drill into a first class vertical milling machine that will do 90% of the lighter jobs as well as the high priced machines.

The "Davis" Milling Attachment is invaluable to any shop, large or small. In the big shop, no matter if you have a dozen large millers, it will come handy when they are tied up with work, for milling of ends of bosses, spotting castings, etc. In the small shop that cannot afford a vertical milling machine, or when the amount of work does not justify the expense of a regular milling machine.

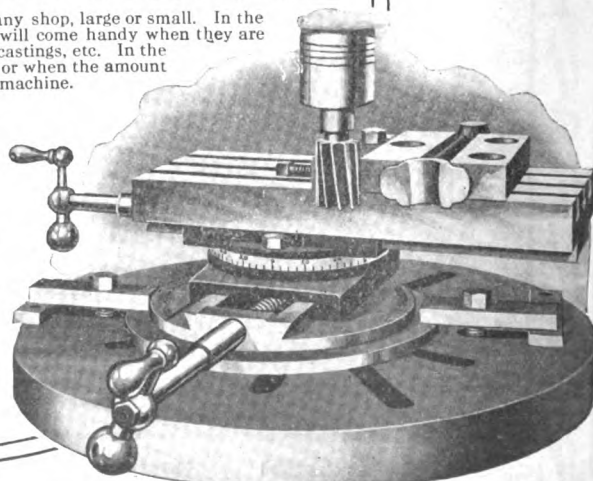
The "Davis" Milling Attachment

A TOOL OF REAL MERIT

It cuts keyseats, straight or taper, cuts the "Woodruff" or half-moon keyseats perfectly, mills deep grooves or slots, cuts jaws and mills cams.

For the diemaker, pattern maker, general repair shops and the automobile garage.

***The Hinckley Machine Works**
Hinckley, Ill.*



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You or some of your customers have a car equipped with Vibrating Coil Ignition, engine is of liberal size, the bearings and general make-up of the entire car is as good or possibly better than a new (medium price up-to-date model) but the Ignition is faulty.

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Don't forget we make

THE MASTER VIBRATOR USED ON FORD CARS.

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Western Branch:—1429 Michigan Ave., Chicago, Ill.



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**For
GASOLINE**

Utility—Construction—Reliability

A Trinity of essential qualifications guaranteeing the Trahern Gasoline Pump to Garage Owners and to all buyers interested in a

Strictly High Grade Gasoline Pump

Each pump is thoroughly tested and properly inspected before shipment, thus insuring satisfaction when the pump is installed.

All working parts are of simple and practical construction.

Nothing to Get Out of Order

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Write for full information and prices.

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Rockford, Ill.

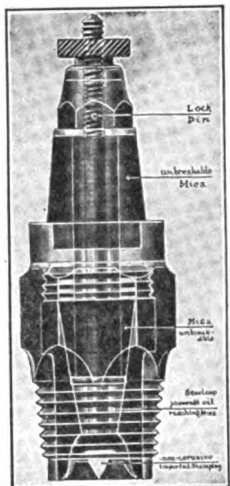
Fig. 386

**Always a Home Run with a
Monarch Spark Plug**

ATTENTION!

**A New Extraordinary Offer
Get NEW PLUGS FOR OLD**

Send us your old, worn-out plugs of any make, and for each one of these old plugs we will make you an allowance of **50 cents** on the purchase of a NEW Monarch Magneto Plug. Of course, this is an advertising plan to introduce our plugs to new users. At this rate you get these at half price.



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Monarch Timers Guaranteed For One Year

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145 Pearl Street

- Mt. Vernon, N. Y.

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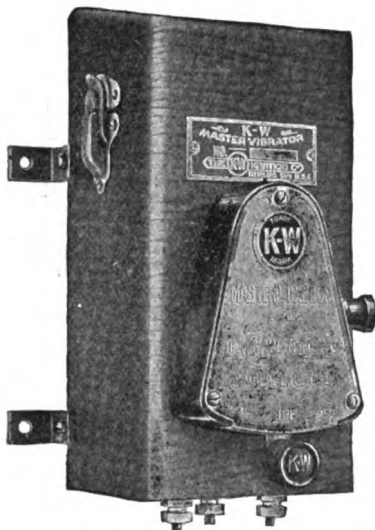
Gentlemen:—Please send me.....Monarch Magneto Plugs (the \$1.00 kind) in exchange for.....old plugs which we will send you when yours are found satisfactory. On the basis of an allowance of 50 cents for each old plug we enclose \$.....to pay for the new Monarch Plugs.

Name.....

Address.....

Size of plugs wanted.....

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The Best Investment You Can Make

The K-W Master Vibrator does a great deal more than simply replace the four separate vibrators on the coil.

It is **NOT A VIBRATOR** in the ordinary sense, but a scientifically constructed magnetic circuit breaker, which times the spark more accurately than the ordinary High Tension Magneto.

It is so designed as to utilize the alternating current of the Ford Fly Wheel Magneto, and makes the coil produce a much hotter spark than it could produce with any other vibrator.

The K-W Master Vibrator takes the place of the separate vibrators on your coil, doing away with the separate vibrator adjustments, giving you one good, fast vibrator and powerful condenser for all of them, thus giving absolute synchronism with a smoother running engine and more power and flexibility at any and all speeds.

The Hot Spark Prevents Sooty Plugs and Carbon Deposits

A hot spark that fires the mixture every time does not allow soot to choke up the plugs or carbon to form in the cylinder.

No matter what coil you have, the K-W Master Vibrator will give you:

A Hotter Spark, preventing sooty plugs and carbonizing.

Easy Starting, due to the hotter spark.

More Power. It makes the hills "Fade Away."

Increased Satisfaction with your car.

A Handsome Kick Switch and **Large Contact Points** that do not freeze.

Easily Put On in half an hour and no changes in the car necessary.

PRICE—\$15.00. Express prepaid if cash accompanies the order.
Order from us or through your dealer.

BE SURE TO GET  **AND HAVE THAT SATISFIED FEELING**

There is only one genuine time-tested and guaranteed Master Vibrator. The scientifically constructed Magnetic Circuit Breaker on the K-W Master Vibrator, when used with the Ford Magneto, will give better results than an ordinary High Tension Magneto.



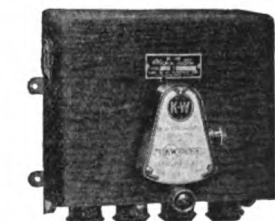
THE K-W SPARK COIL

Single Cylinder Mahogany Dash Coil, with switch....	\$12.00
Double Cylinder Mahogany Dash Coil, with switch....	18.00
Three Cylinder Mahogany Dash Coil, with switch....	24.00
Four Cylinder Mahogany Dash Coil, with switch....	30.00
Six Cylinder Mahogany Dash Coil, with switch....	42.00

The K-W Coil has its winding
GUARANTEED FOREVER
against breakdown.

It gives a hot, fat spark, with a small battery consumption, and it is not necessary to use the Master Vibrator because K-W Coils are

AUTO-SYNCHRONOUS.



DASH COIL



MODEL M COIL.—\$6.00.



MODEL 01 COIL.—\$7.00.

We make a complete line of ignition apparatus.
Don't simply ask for Catalogue—Tell us your troubles and we will help you.

THE K-W IGNITION CO.
2817 CHESTER AVE. CLEVELAND, OHIO. U.S.A.

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ELECTRIC HEAD LIGHT OUTFIT

FOR FORD CARS \$15.00
With Fly Wheel Magneto



Not makeshifts, but are complete in every detail, designed and engineered to work in connection with ignition, both deriving their supply of current from the Ford Magneto.

The Outfit Complete, which is all you need, consists of:

- 1 pair complete Head Lamps.
- 2 Tungsten bulbs, 2-1/16" in diameter.
- 12 feet wire, cut to proper length and soldered to connectors.

1 Switch. Instruction Sheet for Wiring. The Lamps are described below; they fit the forks furnished on the Ford cars.

On Ford cars having fly wheel Magneto, the K-W Generator is not necessary. In fact there is no room to install it, and inasmuch as the Ford Magneto is amply able to care for ignition and furnish lights too, all that is needed is the lamps, bulbs, switch and wire, which cost \$15.00.

THE LAMPS are made entirely of one piece of brass, drawn from steel dies, having no soldered joints, easy to polish, and make a handsome lamp for any car.

THE REFLECTORS in the K-W Lamp are set in the door against a felt ring to keep out dust and moisture. They are made of correctly formed brass, heavily silvered and highly polished on the reflecting surface.

The chief value in an Electric Head Lamp is a perfect reflector. The K-W Reflector is a reflecting lens, optically figured out by one of the foremost optical and lighting engineers of the country, after a long series of experiments.

The focal point of the K-W Reflector, 1.118 inch, is designed to, and will, throw more light forward per candle power of the bulb than any other reflector, as well as lighting both sides of the road brightly. For with this focal depth there is no interference with the direct rays, which are used to light the sides of the road.

The K-W Reflector is manufactured with as much care as is employed in the manufacture of the finest photographer's or optical lens. In purchasing a K-W Head Lamp you are sure of getting a correctly designed and constructed reflecting surface.

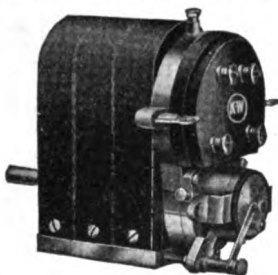
SPECIAL OUTFIT DE LUXE

For those who want something "extra swell" or "classy" for the touring car, we can furnish, if desired, a 9" bullet shaped lamp which also fits the prop furnished on Ford cars. Price \$17.00.

The regular 8" lamp is, however, as large as is required to catch all of the rays and throw all of them forward, and a larger lamp than this is merely for looks. For black finishing add \$1.00 to price of either outfit.

The K-W High-Tension Magneto

For all cars having provision for Magneto



Model J
Guaranteed
to start
auto
Engines up
to 30 H. P.

No Coil
No Timer
No
Batteries
4 Cyl., \$50
6 Cyl., \$55

We make larger Magnetos for larger engines. High Tension Magnetos are for Ignition only. Use Low Tension for Lights. If you cannot gear-drive a High-Tension Magneto, use one of our Low-Tension belt or friction-drive Magnetos and a K-W Spark Coil. Write for details.

We make a complete line of ignition apparatus. Don't simply ask for Catalogue—Tell us your troubles and we will help you.

2817 CHESTER AVE. **THE K-W IGNITION CO.** CLEVELAND, OHIO, U.S.A.

FOR ALL OTHER CARS

Including K-W Alternating Current Generator \$35.00 and \$50.00

Complete outfit: Generator, Head Lamps, switch, wire and bulbs. No storage battery required.

Easy to install on any car with exposed fly wheel or other place to drive the Generator.

No complicated cut-out nor charging device.

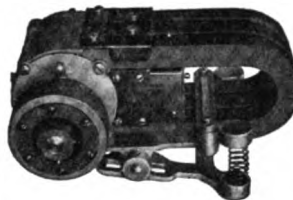
Light weight and simple in operation. No up-keep.

\$35.00 OUTFIT is the model L S Generator and the 8 inch Head Lamps.

\$50.00 OUTFIT is the model U L Generator and the 9-inch Head Lamps.

If desired, we will furnish a foot pedal with either outfit instead of a switch, so it can then be arranged to take the friction wheel off the fly-wheel in the daytime, when not in use.

CURRENT DIRECT FROM GENERATOR



MODEL LS, 3 MAGNET, \$20.00

MODEL UL, 4 MAGNET, \$35.00

This Generator embodies the well known K-W construction, having no commutator, no brushes, and no sliding contacts, the only moving part being the rotor, which swings perfectly free, supported on high duty ball bearings.

Model LS three magnet Generator weighs 18 pounds, and runs two 2 1/2 ampere bulbs (two 16 candle power bulbs). Model U L four magnet Generator weighs 23 pounds, and runs two 3 ampere bulbs (two 20 candle power bulbs). Compare this with the heavy, complicated and costly charging devices.

These are the regular Automobile Head Light Generators, usually mounted in position as above, right over the fly wheel for friction drive, but can be mounted in any position and driven in either direction.

Provided with a special hinged bracket, which can be mounted on either side for easy installation on any car having exposed fly wheel or other place to drive it.

FOR IGNITION

These Generators or low tension Magnetos can be used in place of batteries for ignition if you have timer and spark coil.

There are many high grade cars built several years ago that are still running on battery ignition. It makes a good proposition to fit these cars with a K-W Low Tension Magneto and K-W Spark Coil. This gives them much more power and speed than they ever had before, and makes them run mighty sweet.

USE COMPLETE HEAD LAMPS

The best results in electric lighting cannot be obtained by the use of reflectors put in gas lamps. The highly burnished silvered surface must be protected in a complete dust-proof electric lamp. Get a K-W Lighting Outfit with a complete pair of lamps that are made for Electric Lights, and you will at once see how far superior Electric Lights are to Gas.

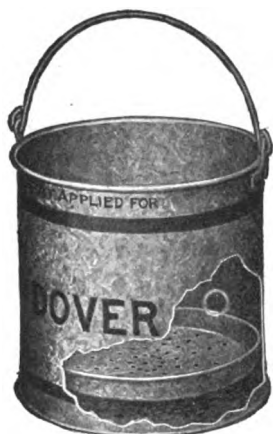
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DOVER Soap Economizer

A perfect pail for washing cars.

Patent applied for.



Will reduce soap consumption at least one-third.

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For carrying extra bulbs safely in the smallest possible space.



Made of steel with a fine black enamel finish.

Capacity: 2 head, 2 side, tail and speedometer lights.

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Combination Measure and Funnel with automatic shut-off.

Patented Oct. 22, 1912.



Positively prevents overflowing the oil tank and spilling oil over the engine and other parts.

Send for 1913 Catalogue.

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Made in Four Styles

MILLER'S HIGH PRESSURE AIR PUMP is Oil Cooled with our Fountain Oiling System. The Bearings and Valves are extra large. The Bore of the cylinder is 3 1/4 inches in diameter and the Stroke is 5 inches. Diameter of Fly Wheel is 30 inches with 3 inch Face. Approximate Weight, 200 lbs. This pump will easily compress air to 300 lbs. pressure.

PUMP ONLY, PRICE, SINGLE, \$35.00

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Furnished for steam line or complete with Gas or Gasoline Burner, and New Improved Boiler. This boiler generates an abundance of steam.

PRICES from \$5.00 to \$30.00

Innerliners in one piece 100 ft. long, 3 or 4 ply, 50c per lb., less 5% for cash.

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Net Prices—Cash with Order 5 per cent. off.

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28x2 1/2 inches.....\$1.95	31x4 inches.....\$3.20
28x3 ".....2.30	32x4 ".....3.40
30x3 ".....2.55	33x4 ".....3.60
32x3 ".....2.75	34x4 ".....3.95
29x3 1/2 ".....2.55	35x4 ".....4.15
30x3 1/2 ".....2.80	36x4 ".....4.30
31x3 1/2 ".....3.05	40x4 ".....4.80
32x3 1/2 ".....3.20	34x4 1/2 ".....4.45
34x3 1/2 ".....3.40	35x4 1/2 ".....4.85
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Cement Stock for Tubes... 1.75	
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No Cement Patches, per dozen packages.....	2.50
No Cement Patching Rubber, sheet form, per lb....	2.00
Fabric Sea Island Cotton, 17 1/2 ounces, one or two sides.....	1.10
Fabric Common Tire Cloth, 18 ounces, one or two sides.....	.65
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Miller's Three In One Repair Stock.....	1.20

This stock repairs casings and tubes and makes cement, and eliminates the necessity of carrying a large variety of repair material.

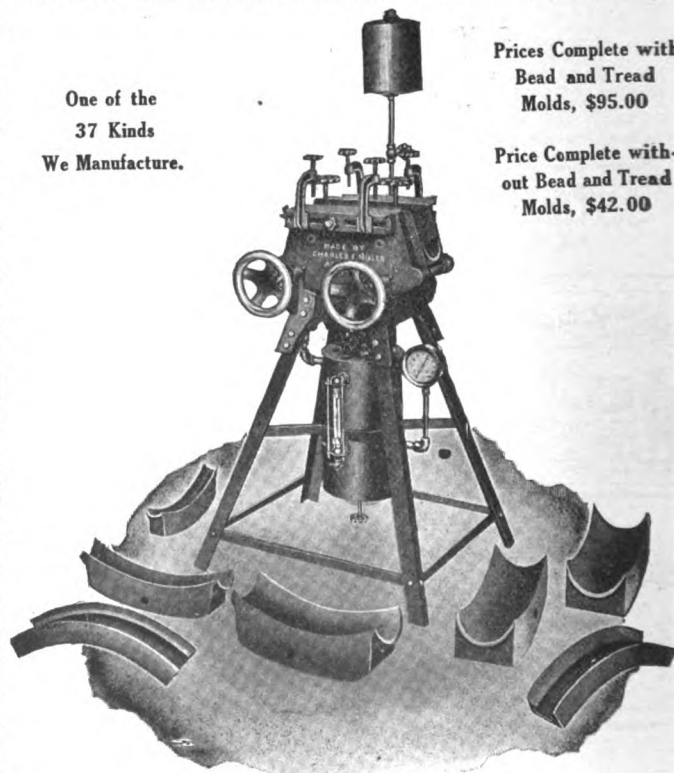
The above prices subject to 5 per cent. discount for cash with order, or in 100 pound lots or over, 10 and 5 per cent.

Write for our 44-page Catalogue, which illustrates large kettle vulcanizers; adjustable sectional vulcanizers; inner tube vulcanizers; inside vulcanizers; retreading vulcanizers; adjustable segment iron cores, tread rollers, power wrapping machines, steam boilers, grinding stands, circular wire brushes, grinding wheels, full line of small rubber tools, tire lasts, automatic steam traps, steam regulators, air bags, gas tubing, auto bumpers, baby carriage tires, inside and outside blow-out boots, no cement patches, repair stocks, hand-made bicycle tires, motor cycle casings and red tubes of extra quality.

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The kind that repairs everything in the Tire line—all sizes of bicycle, motor cycle, auto and aeroplane tires, also 4 to 6 inner tubes at one time. Made and designed by the man who originated and patented the Cavity Vulcanizer, so generally used throughout the world.

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Discount on Complete Set 3 to 5 1/2 Inch

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Reduces Tire Costs
Increases Resiliency
Lessens Chances Of Puncture
Accurately Tells How Much
Air In Tires

This unusual offer is made for the purpose of placing in every car owner's hands an



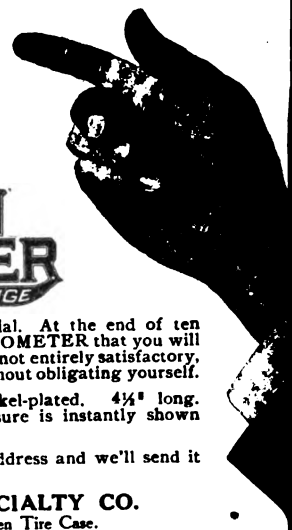
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We offer it to you for a Ten Day Free Trial. At the end of ten days you will be so pleased with the TYROMETER that you will gladly remit the price, which is \$1.00. If not entirely satisfactory, you may return TYROMETER to us without obligating yourself.

Absolutely accurate. Handsomely nickel-plated. 4 1/4" long. Has clip cap. Press on valve and pressure is instantly shown and held until you release sliding band.

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Absolutely Automatic.

This shield operates with more ease than any other.

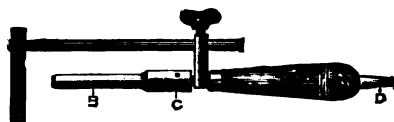
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Light Delivery Cars
Send for Pamphlet 95



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The idea of this Rectifier is the charging of lighting and ignition batteries at one's own home, from an alternating current and at a particularly low cost.

We guarantee every Simplicity Rectifier to be free from flaws of material and workmanship.

This Rectifier will add at least one-third to the ordinary life of the best battery made.

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Get This Sure Protection Against Car Robbers The Watch Dog Lock

PATENT APPLIED FOR.

Price \$2.00. Write at once for Descriptive Circular.

S. BREAKSTONE
1712 Michigan Ave. Chicago, Ill.

48 GREAT ENGINEERS BUILD THEIR FOUR-CYLINDER MASTERPIECE.

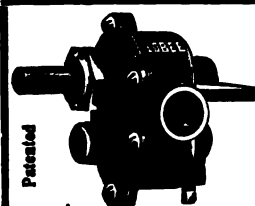
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save labor, water and hose.

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strengthens tires and prevents punctures and blowouts, gives honest, reasonable service.

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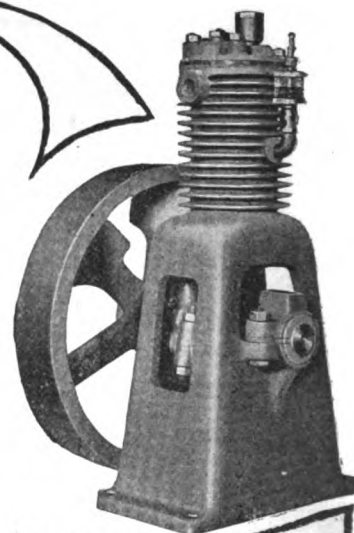
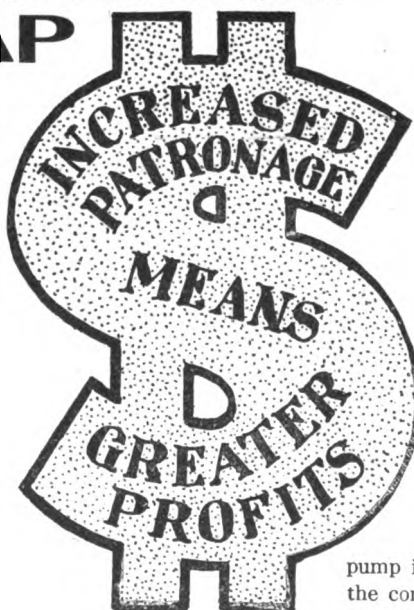
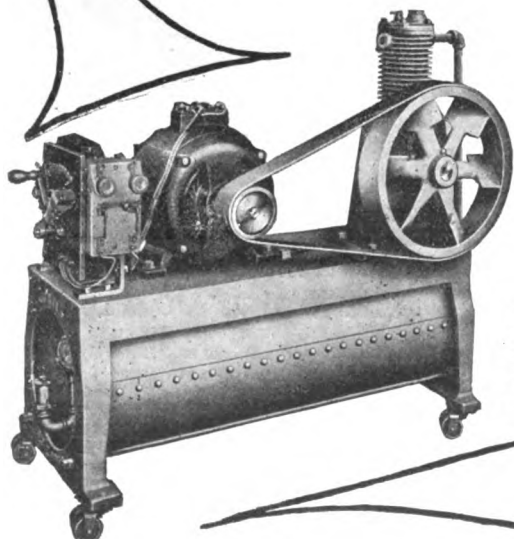
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TO HAVE AND TO HOLD

The principle in business is to hold what you have and gain more.

By furnishing air free to your patrons, and to be able to furnish it on short notice, is a great convenience, as well as a means of showing your patrons that you are taking good care of them.



We can furnish the Curtis common sense garage air pump in 2x2½ and 3x3½, either the compressor alone for belting direct to motor or line shaft, or as a self-contained air unit mounted on casters with motor, starting box and air tank complete; or on short leg base with motor, compressor, governor, air tank and starting box, with or without automatic starting and stopping device that automatically starts up the compressor when the air pressure drops and stops it when the pressure reaches the set maximum. Write for full details and prices.

CURTIS & CO. MFG. CO.
1530 Kienlen Avenue, ST. LOUIS, MO.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

ATTENTION

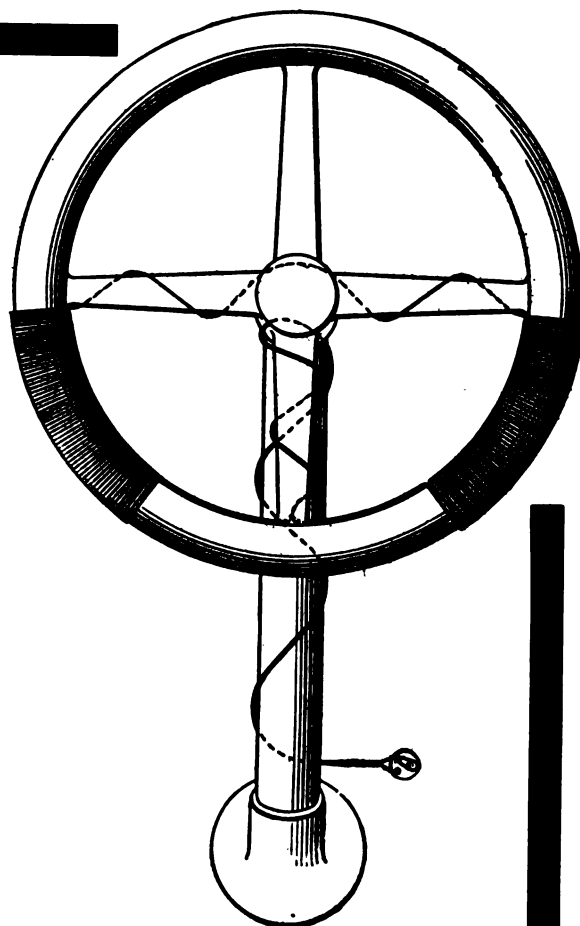
FORD Car Owners

Every time you go out driving now,
your hands are cold.

At slight expense you can be warm
and comfortable, even on a zero day
or in a howling blizzard, by installing
one of our

WARM HAND STEERING WHEELS

This can be accomplished in a half-
hour, by yourself.



PATENTED APRIL 23, 1907.
PATENTED FEB. 11, 1908.
PATENTED APRIL 2, 1912.
Other Patents Pending.

The Electric Warm Hand Steering Wheel

Consists of a new wooden rim, just the same as you now have on your car, with
our electrical heater all attached. It is operated by your magneto, without inter-
fering in the slightest degree with the running of your car.

To install this device you simply take the four screws that hold on the wooden
rim out of your steering wheel and replace with one we send you.

Adapted not only for Ford cars, but for almost any other make.

Will be sent prepaid to any part of the United States on receipt of **\$15.00**,
or can be supplied through any reputable dealer.

We absolutely guarantee this device to produce the results claimed for it or
money refunded.

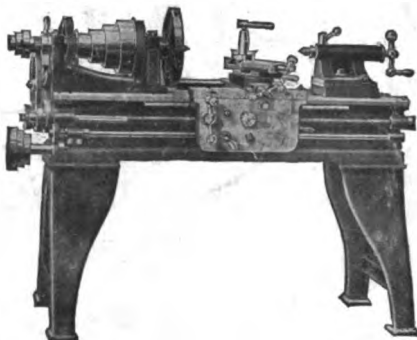
Free descriptive circular giving full particulars furnished on application.

DEALERS TAKE NOTICE.

You had better get in touch with us, because we have a liberal
dealers' proposition and want representation in your territory.

THE WARM HAND STEERING WHEEL CO.
527 FIFTH AVENUE, NEW YORK

SEBASTIAN 15-INCH LATHE



The LOW-PRICE, PERFECT-QUALITY lathe for the GARAGE and GENERAL REPAIR SHOP.

If you are in the market for a lathe be sure and investigate the merits of the SEBASTIAN.

CATALOG mailed free on request

THE SEBASTIAN LATHE CO.

108-110 Culvert Street, Cincinnati, Ohio

BROKEN PARTS WELDED

Cracked cylinders and crank cases—practically all metal parts of the car—made as good as new. All repairs made within 24 hours after part reaches our shops.

Illustration shows cylinder on which we saved the Consolidated Motor Co., Bridgeport, Conn., \$30.00.

Scored Cylinders a Specialty

Our special welding process repairs cylinders scored by loose wrist pin. Bore is not enlarged—old piston and rings will fit. Our charge, for cylinders up to 6" bore, \$12.00.

Cylinders worn out round or scored in many places need re-boring. We have special machines—same as manufacturer's—for this work. We re-grind the cylinder perfectly round and fit new piston and rings. No loss of power in the motor. Charges according to size of bore. Always send piston with cylinder.

Write for full information.

Guarantee of Protection

If, within one year from date of repair, part is found unsatisfactory, because of poor workmanship on our part, return to us (by freight, collect). Upon inspection we will refund your money, or, if you prefer, do the work over without extra charge. We assume no liability for value of parts sent us; all parts received at scrap value.

Waterbury Welding Company

1148-C South Main St., Waterbury, Conn.



Have a Genuine "Hagstrom" Porcelain Guard Spark Plug With Our Compliments.

"Don't Envy a Smooth Running Motor. Use Hagstrom Spark Plugs and Have One."

This Non-Conductive Porcelain Guard Feature Alone Worth the Price of the Plug

Cut out this ad.—fill in the blank—stuff it an envelope with a \$1.00 bill, and 8c. postage, and you'll receive two plugs at the price of one.

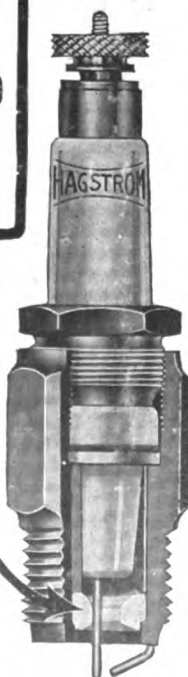
Your money back if the "Hagstrom" is not the most satisfactory plug you ever used on a Ford, or any other car.

Name.....

Address.....

Size Plugs.....

THE HAGSTROM BROS. MFG. CO., Box L, Lindsborg, Kansas.



Golden Star Auto Body Polish Keeps Your Car Well Groomed

It cleans, polishes and protects the finish.

Does not leave a greasy surface.

Easy and convenient to use.

A few drops of Golden Star Polish used on the dust cloth and your car looks bright, clean and new.

Free Sample

Let us prove (without cost to you) the merits of Golden Star. "The World's Best Cleaner and Polisher." Ask your dealer for a free sample or write us and it will be sent you at once.

DEALERS—Your customers will appreciate good service. Sell them Golden Star Polish. Ask your jobber—he can supply you.

R. W. MORRIS MFG. CO.
Incorporated

Kansas City Missouri



CHICAGO SHOW NUMBER

This Magazine is represented at Space 1-X, Armory Gallery, Chicago Automobile Show, Feb. 1-8, 1913

Automobile Dealer and Repairer



A JOURNAL OF PRACTICAL MOTORING

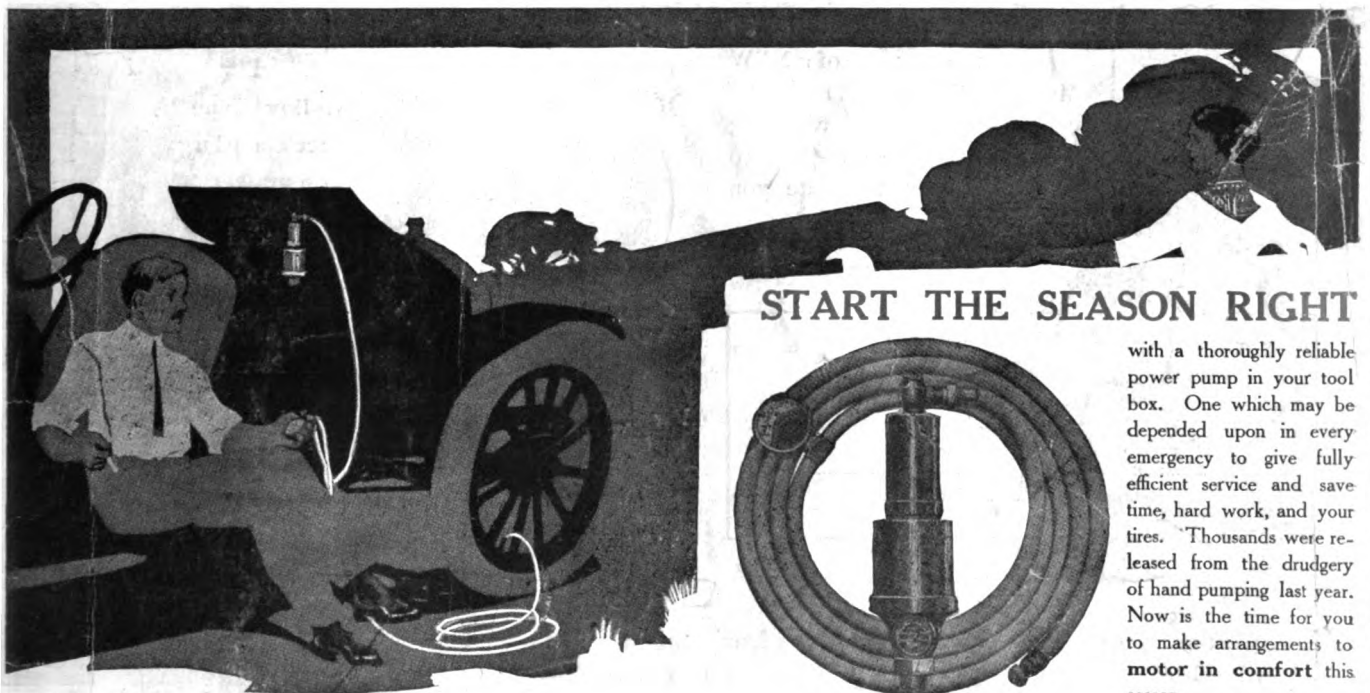
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THE MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Vol. 14, No. 5.

NEW YORK, JANUARY, 1913.

Monthly, \$1.00 per year
Single Copy 10 Cents.



START THE SEASON RIGHT

with a thoroughly reliable power pump in your tool box. One which may be depended upon in every emergency to give fully efficient service and save time, hard work, and your tires. Thousands were released from the drudgery of hand pumping last year. Now is the time for you to make arrangements to motor in comfort this season.

MAYO SPARK PLUG PUMP

Anybody can use it with SURE RESULTS

SIMPLY REMOVE A SPARK PLUG from any convenient cylinder and substitute pump (with the hands only) is the advantageous method of attaching to all motors. After connecting the hose from the pump to the tire, the motor should be started and run on low throttle from two to four minutes until the tire has been inflated to the pressure desired. A half-inch plumber's valve or pet-cock may be installed permanently in one of the engine cylinders, making it unnecessary to remove a spark plug each time in using. The pump inflates the tire with nothing but PURE, FRESH AIR, is noiseless in operation, non-adjustable, requires no attention whatever other than an occasional drop of oil, and works equally well on all sized cars from the smallest Ford to the largest Lozier.

GUARANTEED and INDESTRUCTIBLE

OUR DESIGN MAKES THIS PUMP ABSOLUTELY INDESTRUCTIBLE. The pumping piston only operates when motor is run on low throttle and automatically locks when the engine is raced; again operating when the throttle is lowered. An article that is small, light, compact, weighing only two and one-half pounds, which may be carried anywhere — always in working order and ready for use.

Demonstration at the Chicago Automobile Show

TRY IT ON YOUR OWN CAR FREE BEFORE PURCHASING

Furnished complete and ready for use with bushing to fit any car,
and 12 feet hose and connections (Pressure Register, \$2.00 Extra) **\$10.00**

MAYO MANUFACTURING CO., Manufacturers, 59 East 18th Street, CHICAGO, ILL

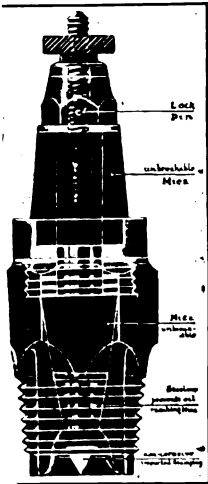
BUYERS' GUIDE AND INDEX TO ADVERTISEMENTS, PAGES 80, 81 AND 82
The Table of Contents will be found on Page 128

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Auto Owners Don't Miss This

For Ten Years Benford's Monarch Products Have Been Known as the Best

Always a Home Run with a Monarch Spark Plug



ATTENTION!

A New Extraordinary Offer
Get NEW PLUGS FOR OLD

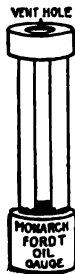
Send us your old, worn-out plugs of any make, and for each one of these old plugs we will make you an allowance of 50 cents on the purchase of a NEW Monarch Magneto Plug. Of course, this is an advertising plan to introduce our plugs to new users. At this rate you get these at half price.

ONLY 6 PLUGS TO ONE CUSTOMER

BENFORD MFG. CO., 150 Pearl St., Mt. Vernon, N. Y.

GENTLEMEN:—Please send me.....Monarch Magneto Plugs (one \$1.00 kind) in exchange for.....old plugs which we will send you when yours are found satisfactory. On the basis of an allowance of 50 cents for each old plug we enclose \$.....to pay for the new Monarch plugs.

me.....
address.....
number of plugs wanted.....



MONARCH OIL GAUGE

For Model T Ford Cars

Takes the place of the lower pet-cock on the transmission case and shows at a glance how much oil there is in the car.

MONARCH TIMERS



For reliability cannot be beat.
Guaranteed one year.

2 Cylinder.....\$2.75
3 and 4 Cylinder..... 3.00

Special short shaft timers to fit, for Ford, Buick and Maxwell.

A Snap For

Ford Owners

4 Genuine Peerless plugs, guaranteed, and our Oil Gauge, \$2.00.

Peerless SPARK PLUG

The Best
Hollow Type
porcelain plug
on market.

Special
Magneto Wire
points.

Best Porcelain.



Any not found satisfactory after six months will be replaced Free.

50c. each

MONARCH GAS LIGHTER

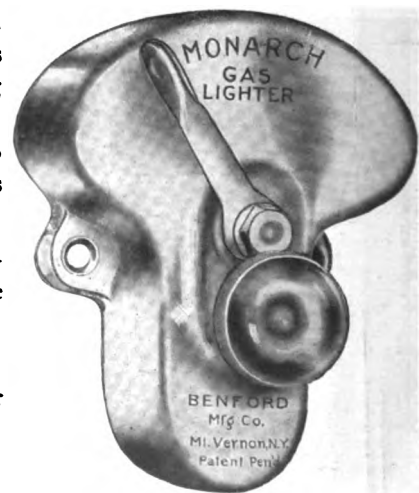
Push the lever once, that's all, and your Gas Lamps are lit. The Monarch lighter has been so carefully designed and simplified that it is the only Gas lighter on the market today that is giving the results the motorist is looking for. The lighting of the Gas Lamps from the seat while the car is in motion. The main feature, the positive allowance of just the proper amount of gas to an even flame to the burners, is all accomplished by one motion. Press ever forward, that's all, and your lamps are lit.

To turn out your lamps without getting out of the car, turn the thumb-controlling valve to right and lamps are out. We positively guarantee possible to blow off lamps when turning on Gas.

Monarch Lighter furnished complete with best No. 12 ALCO burners, fine German Lava Tips, wire, brass tubing, etc., with instructions for lighting in one hour's time.

Price, - - \$6.00

Deliveries on this Lighter After February 1st, 1913



BENFORD MFG. CO., 145 Pearl St., Mt. Vernon, N. Y.

EMANCIPATE

Yourself from slavery to tires.

You can run right through the winter without touching your tires if you equip them with the new

Double Grip *Woodworth Treads*

They are expressly made to give traction in snow and ice; the special high rivets, cupped and hardened and spaced two inches apart, effectively supplement the regular rivets. Once on, they need no further attention—they are like a part of the tires.

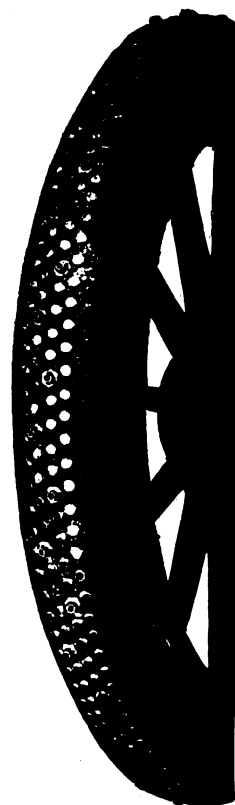
Punctures are prevented, frost-nipped fingers saved, repairs eliminated, and the Woodworths pay for themselves in the added life of the tires. Compare that with what you are paying for chains and all their annoyances!

WOODWORTH TREADS are held constantly snug by stiff side springs. They never loosen and chafe; they are broadly guaranteed for mileage and against damage to tires. Their patented construction solves the three problems of skidding, punctures, and tire expense.

Protect your tires while they are in good condition! Write today to us or to our nearest distributor.

LEATHER TIRE GOODS COMPANY

NIAGARA FALLS, N. Y.



In spring or summer use the regular style

Woodworth Treads

They prevent skidding, abolish punctures, and pay more than their cost in the tire life they add.

New York Store

1608 Broadway

Good Agents Wanted for Un-occupied Territory.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

This Can't Happen

With Durable Treads. Chains ruin your tires—cut them up—reduce their life. Chains are not always safe. It's a big job to attach them—it's a big job to remove them. They're a nuisance. Some States prohibit their use. Thousands of car owners are abandoning them.

But **Durable Treads** are different. They're put on to stay—and they **do** prevent skidding. That much **everybody knows**.

But, further, they do not cut or ruin your tires—they **protect and save them**—make them **last three seasons instead of one**.

If your tires are protected by **Durable Treads** you can travel over the most disastrous frozen roads, with never a fear of puncture, cut or blow-outs. You will experience no unpleasant road delays—your tire bills will vanish.

Read Our Guarantee

With **Durable Treads** we will give you a written legal guarantee for 5000 miles without puncture. This is binding whether your tires are new or old, tread-worn, rim-cut or rut-worn.

Durable Treads are the only treads built to protect your tires against rim-cuts, rut-wear and side blow-outs.

With **Durable Treads** the resiliency of your tires is just as great—high speed just as easy—cost of gasoline no more.

This is the most liberal guarantee ever given with a tread.



GUARANTEED 5000 MILES WITHOUT PUNCTURE

Durable Treads

They Can't Skid

Tire Expense Reduced Half

Your tire expense is now actually 1½ to 4 cents per mile.

It is greater than that of gasoline and oil combined. Yet it can be eliminated through **Durable Treads**.

For with **Durable Treads** punctures, blow-outs and tire repairs will be eliminated.

If you'll stop to figure out what this means, you'll find that you spend enough on repairs each season to almost maintain your car.

Forcing Recognition!

Every day the list of **Durable Treads** converts is growing. And only because **Durable Treads**, through their remarkable advantages, are forcing that recognition.

This season our sales are doubling month by month, for car owners now realize that **Durable Treads** are not an experiment but a proved quantity—a most vital factor in automobile construction. They should soon become part of the standard equipment.

Cost Half of Tires

A set of tires cost \$50 to \$200. But **Durable Treads** cost less than half that. Hence, isn't it more economical to protect these costly delicate tires?

Isn't it more economical to buy **Durable Treads**, at half the cost of tires, than to buy new tires each season?

Durable Treads are a leather and canvas cover—studded with steel rivets—that covers the entire tire, just as it stands on your car.

Test At Our Expense

We want you to know just what **Durable Treads** are before you invest a cent or promise to buy.

We will ship you a pair or full set, with your permission, for inspection. We pay all express charges—you are not put

to a cent's expense, obligation or trouble. This examination will cost you nothing.

Special Discount

If **Durable Treads** are not already represented in your territory, we will make shipment to you direct from the factory, and allow you our **full dealers' discount** on your initial order.

This is merely to introduce them. It is an excellent opportunity for you to equip your car at almost cost.

It must be taken advantage of immediately, for the inquiries and orders each day are rapidly filling all territories.

Send Coupon For Facts

We have explained to you without exaggeration just what **Durable Treads** will do! We have shown you how to save \$50 to \$200 each season.

Now we want you to send the coupon to us at once for copy of our legal guarantee and other conclusive proofs.

COLORADO TIRE & LEATHER CO.,

526 W. 34th St., New York City, N. Y.
1208 Majestic Bldg., Chicago 1077 Broadway, Denver, Colo.
436 Golden Gate Ave., San Francisco, Cal.

Address Nearest Office.

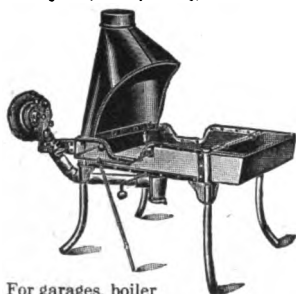
COLORADO TIRE & LEATHER CO.
1208 Majestic Bldg., Chicago 1027 Broadway, Denver, Colo.
436 Golden Gate Ave., San Francisco, Cal.

Dear Sirs:—Please send me at once, without obligating me, sample of Durable Tread leather, booklet, copy of guarantee, price of Durable Treads and special discount offer.

Name
Street Address
City State
My Tire Sizes Are

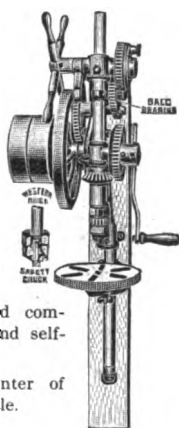
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Royal (Steel) Forge No. 37



For garages, boiler makers, horse shoers or any first-class forge shop.

No. 19 Drill



A low priced combined hand and self-feed drill.

Drills to center of 16 1/4-inch circle.

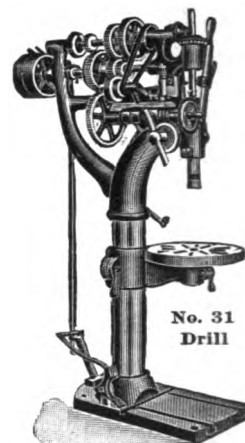
When in need of a
FORGE, BLOWER,
DRILL, PUNCH,
Or SHEARS,

for your garage or repair shop, purchase a Canedy-Otto and get the best.

There is a reason—QUALITY.

Send for Catalogue.

CANEDY-OTTO MFG. CO.,
CHICAGO HEIGHTS, ILL.



No. 31 Drill

20-inch upright drill, gear driven. No belts. Has hand lever-feed, also power self-feed with automatic stop.

No. 1 Shear



For cutting flat and round bars.



Safety
Demands a Real Signal

Put a WATRES Power Whistle on your car and you will have the maximum protection as far as the signal is concerned. It is the most efficient and economical warning device ever invented.

Blown by exhaust gas from the engine, stored in a tank so you have available pressure always, whether engine is running or not. Operated by foot pedal. The Watres Whistle costs nothing to operate and has no working parts to wear out.

Test This on Your Car for 30 Days.

We will refund your money if it doesn't prove invaluable to you after 30 days' use.

Write today for Booklet.

H. E. BOUCHER MFG. CO.
20 Fulton St., :: New York City.

AUTOLINE
TRADE MARK
OIL

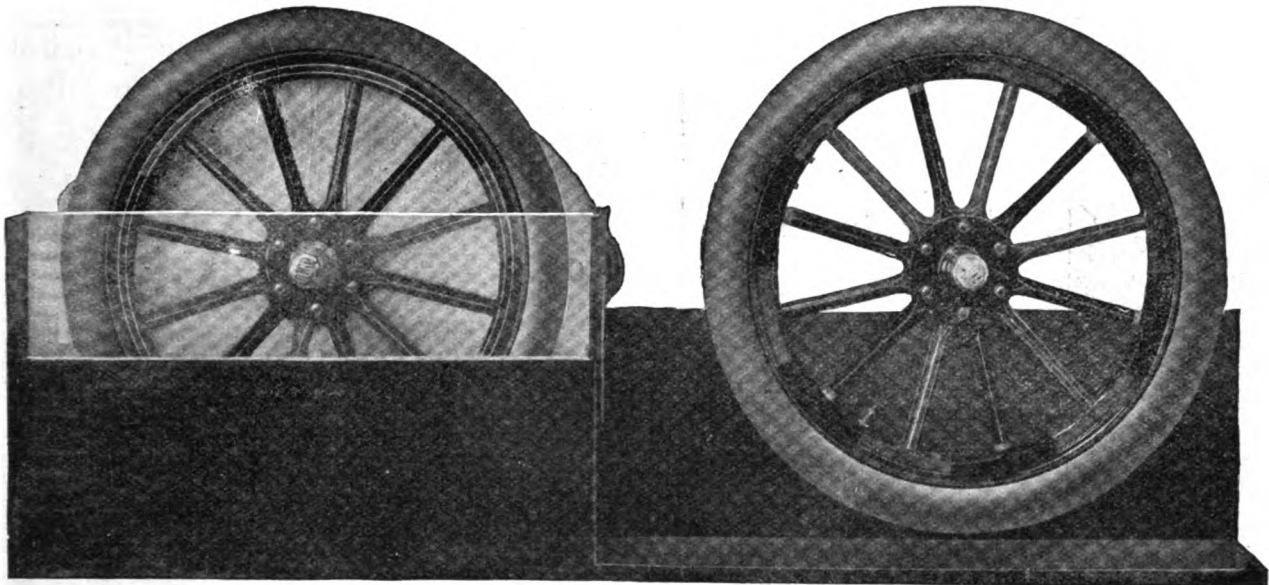


THE OIL THAT MAKES GOOD!

At your dealer-If not write direct
Wm. C. Robinson & Son Co.
Baltimore, U.S.A.

The Varnish that Defies Soap

See It at the Automobile Shows



Look for the wheel revolving in the soapy water at our Booth

at the National Automobile Show at Madison Square Garden and at the other shows later.

It is a startling demonstration of our Vanadium Chassis Finishing, a varnish which is absolutely unharmed by the caustic action of automobile soap.

Six of the spokes of the wheel are finished with the best automobile gear varnishes heretofore made. They cannot withstand soap and turn gray and lose their lustre. The other six spokes are finished with

Valentine's Vanadium Chassis Finishing

These spokes stand up absolutely unharmed after weeks of exposure to soap and water. This is the varnish for the hood, fenders, and underparts of your car. It resists mud, road oil, grease, and the heat from the motor, as well as it resists soapy water. It will keep the finish of these parts of your car in perfect condition many months after the ordinary varnish would be destroyed.

You will be interested in a new booklet we are issuing, "The Care of the Car." It tells all about how to preserve the finish of the car, and will, we are sure, prove of value to you. It describes Vanadium Chassis Finishing. We should like to send it to you, free of charge of course. Just fill out the coupon.

Valentine & Company,

456 Fourth Avenue
NEW YORK

343 S. Dearborn Street
CHICAGO

74 Pearl Street
BOSTON

TRADE **VALENTINE'S** MARK
VARNISHES

FILL IN, TEAR OFF, MAIL TODAY
VALENTINE & COMPANY, 456 Fourth Ave., N. Y. C.
NAME.....
ADDRESS.....
Please send me copy of
your booklet,
"The Care of the
Car."

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Golden Star Auto Body Polish Keeps Your Car Well Groomed

It cleans, polishes and protects the finish.

Does not leave a greasy surface.

Easy and convenient to use.

A few drops of Golden Star Polish used on the dust cloth and your car looks bright, clean and new.



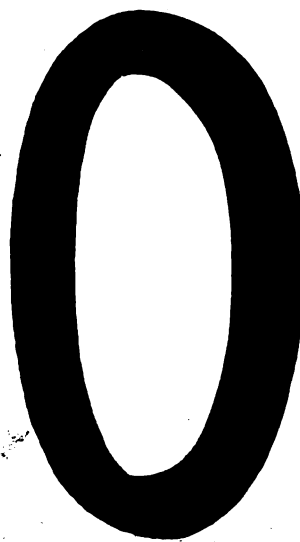
Free Sample

Let us prove (without cost to you) the merits of Golden Star, "The World's Best Cleaner and Polisher." Ask your dealer for a free sample or write us and it will be sent you at once.

DEALERS—Your customers will appreciate good service. Sell them Golden Star Polish. Ask your jobber—he can supply you.

R. W. MORRIS MFG. CO.
Incorporated
Kansas City Missouri

SOLVING THE TIRE PROBLEM



The tire problem is solved for automobilists when they reinforce their tires with the Original O'Neil Tire Protector.

**Sold Through
Cleveland Office**

Tire dealers can obtain prices and terms on the Original

O'Neil Protector through the Cleveland, Ohio, office. Puncture proof, as proved by users. Write for quotations.

The O'Neil Tire & Protector Co.
Cleveland, Ohio

Seamless Steel Tubing

Over 1,000,000 Feet on Hand.

SEND FOR OUR LIST.

1500 SIZES.

YOUR SIZE IS HERE.

ALSO COLD DRAWN SEAMLESS TOOL STEEL TUBING.

WRITE NEAREST OFFICE

GEORGE NASH CO.,
317 Pearl Street
New York City

EDGAR T. WARD & SONS
25 Purchase Street
Boston, Mass.

FIELD & CO., Inc.
115 N. Seventh Street
Philadelphia, Pa.



The Ideal Cut-Out

Simply Cut Notch in Exhaust
Pipe and Clamp over it.

PRICES

No. 5B	For Pipe, 1 1/2 in. o. d.	\$1.50
" 6B.	" 1 3/4 "	1.65
" 7B.	" 2 "	1.75
" 7D.	" 2 1/4 "	1.75
" 8B.	" 2 1/2 "	2.00

Gray Lock Pedal

No. 3.	Black	\$0.60
" 3.	Brass	.75
" 3.	Nickel	.80

*Liberal Discounts.
Ask for Catalogue.*

GRAY-HAWLEY MFG. CO., 937 Jefferson Ave.
DETROIT, MICH.

Auto Directories Co., Inc.

CERTIFIED COPIES OF THE OFFICIAL LIST OF AUTO OWNERS, CHAUFFEURS, DEALERS, GARAGES, MANUFACTURERS AND JOBBERS IN THE U. S. AND CANADA. ALSO MOTOR BOAT OWNERS.

**Offices, 1717 Broadway
NEW YORK CITY**

*Phone 858 Columbus.

Will Not FREEZE

Will not injure
any part of the
car.

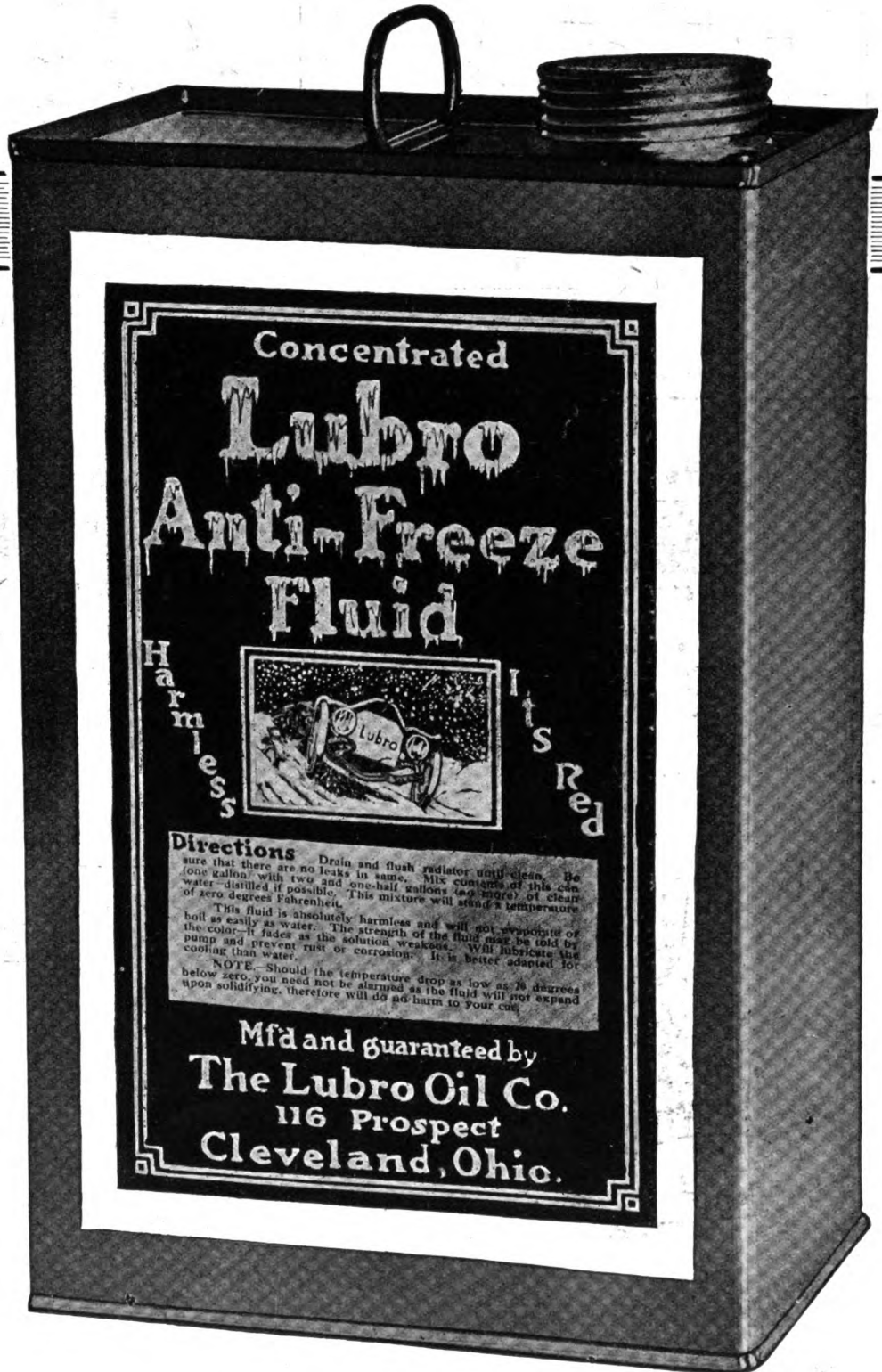
Will not evapor-
ate or boil as easily
as water.

Will lubricate the
pump.

Will prevent rust
and corrosion.

Better adapted
for cooling pur-
poses than water
itself.

IT'S RED



LUBRO ANTI-FREEZE FLUID is packed six one-gallon cans to a case, in five and ten-gallon jacketed cans and thirty and fifty-gallon steel drums with faucets. We will ship one gallon of LUBRO ANTI-FREEZE FLUID upon Receipt of \$1.50.

One gallon is sufficient for your radiator. One application is sufficient for the season.

JERICHO **JERICHO**

Jericho

Leader in Sales and
Popularity.
DEALERS EVERYWHERE



OVER 100,000
NOW IN USE

RANDALL-FAICHNEY CO.
BOSTON, U.S.A.

JERICHO **JERICHO**



"STAR" LATHES

9 in., 11 in., 13 in. SWING.
Suitable for fine accurate work
in the garage, repair shop, tool-
room and machine shop.
Send for Catalog B.
THE SENECA FALLS MFG CO.
429 Water Street, SENECA FALLS, N. Y.


A-1



TEN EYCK AUTOMATIC TIRE PUMP

Starts and stops by
merely attaching the
hose to the tire.
Write for Catalog.
Auburn Auto Pump Co.
537 Tremont St., BOSTON MASS.
Fitzgerald Building, 43rd St. and
Broadway, New York City.

HAYWOOD STEAM VULCANIZERS THE PROFIT MAKING PLANTS



The vulcanizing
system that DOES
NOT use air bags.
SOLID PADS and
HEAVY CLAMPS
are the means
through which
pressure is gener-
ated.

Plants from \$25
to \$500
Write for Catalog

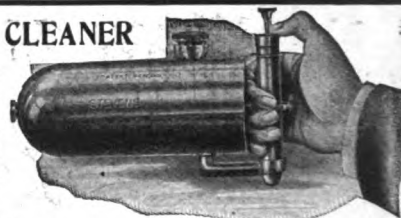
HAYWOOD TIRE & EQUIPMENT CO.
528 N. Capitol
Indianapolis, Ind.

Packard CABLE

—FOR—
ELECTRIC LIGHTING & STARTING SYSTEMS
MAKES GOOD WITH A VENGEANCE.
As Does Also OUR FAMOUS IGNITION CABLE.
Make that Repair Job PERMANENT.
Complete Stock For Immediate Shipments. Our wire awaits your wire.
ABSOLUTE SATISFACTION GUARANTEED.
THE PACKARD ELECTRIC COMPANY, 329 Dana Ave., WARREN, OHIO.

STEVENS AUTO CLEANER

Automobile Owners, Garages,
Machine Shops, find this de-
vice indispensable. Saves
hands and clothing and pro-
longs life of costly machin-
ery by instantly removing
grease, grit and dirt. After
using this Cleaner, adjust-
ment of an automobile is a
pleasure. Can be used by
Florists, Printers, Hos-
pitals, Laundries, etc. Will deliver a fine spray or a dynamic stream. Fin-
ished in solid polished and lacquered brass. Price complete with pump, \$6.00.



STEVENS AUTO TIRE VALVE

Adopted by RALPH DePALMA, Winner of the Vanderbilt
Cup at Milwaukee, 1912. Can be attached instantly without ex-
pense to any inner tube stem, on any car. Saves one-half the
time and labor necessary to inflate tires by any other method.
Easily adjusted. Warranted not to leak.
200 000 in use. Send \$1.00 for set of four. Try them 30 days,
and if not satisfactory, money will be cheerfully refunded.



STEVENS MANUFACTURING AND SUPPLY COMPANY,
1223-25-27 Wabash Avenue, Chicago, Ill., U. S. A.

AUTOMOBILE

Bodies, Chassis,
Wheels, Steer-
ing Devices, front and rear Axles, Steel
Rims, etc.

GET OUR PRICES AT ONCE.

BORBEIN AUTO CO.



2109-2111 N. 9th Street,
ST. LOUIS, MO.

Invader Gear Oil Puts Noisy Gears to Sleep



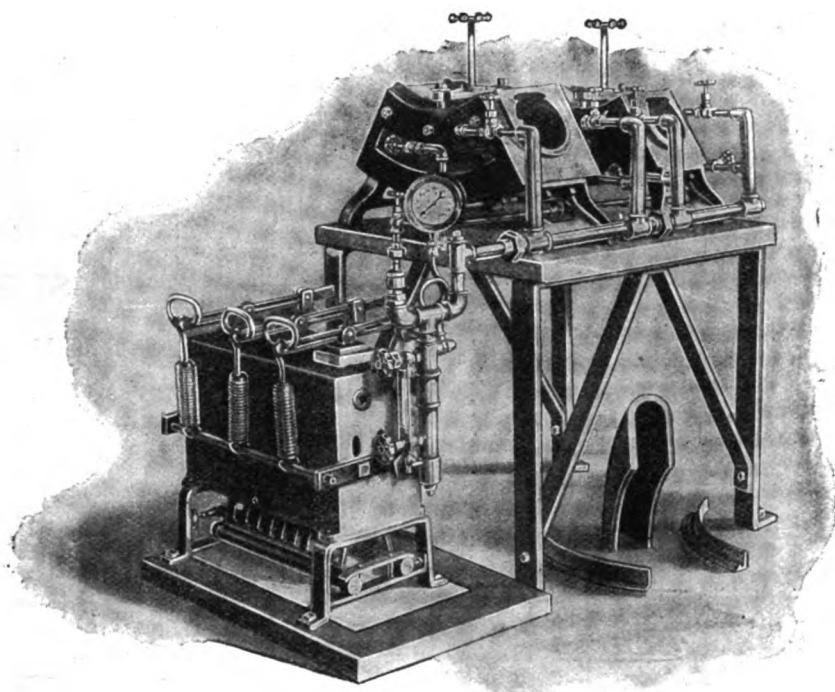
This is a fluid lubricant. It is always
uniform, 100% oil of the same strength,
contains no water or chemicals. Will
not foam in the case when running or
rust bearings when remaining idle. It
is a stronger and more economical
lubricant than any grease made, in-
cluding our own.

Sold in ten pound, twenty-five
pound and fifty pound cans. Chas. F. Kellom & Co. 113 Arch St. Philadelphia
New England Branch, 284 Columbus Ave., Boston

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Forty Million Dollars For Tire Repairs

The 1,200,000 cars in use in 1913 will necessitate spending at least \$40,000,000.00 per year for tire repairs. At least six million tires will be used. Every 200 cars will produce at least \$6,000.00 worth of this business which carries an average profit of 40%.



No. 5. EQUIPMENT FOR GAS OR GASOLINE.

We have many other outfits, both self steam generating and for an independent boiler.

YOU OUGHT TO SHARE IN THE PROFITS. Install an Akron-Williams outfit, the kind used and recommended by twenty-seven out of thirty tire makers and by successful repair men everywhere. Ask your tire maker about us.

IT DOESN'T TAKE MUCH MONEY to buy the best plant and you can make more with it than with an investment four times as large in any other line. We have outfits from \$40.00 to \$1000.00, depending upon how much and what range of work is to be handled. Every outfit is standard.

GET INTO THIS PROFITABLE BUSINESS NOW.

Write Today for Catalogue 121.

"IF IT IS USED TO REPAIR TIRES, WE MAKE IT."

THE WILLIAMS FOUNDRY & MACHINE COMPANY

GLENDAL AVENUE - - AKRON, OHIO

TRAHERN GARAGE PUMP

**For
GASOLINE**

=

Utility—Construction—Reliability

A Trinity of essential qualifications guaranteeing the Trahern Gasoline Pump to Garage Owners and to all buyers interested in a

Strictly High Grade Gasoline Pump

Each pump is thoroughly tested and properly inspected before shipment, thus insuring satisfaction when the pump is installed.

All working parts are of simple and practical construction.

Nothing to Get Out of Order

Every Garage Owner should investigate it.

Write for full information and prices.

Manufactured by
Trahern Pump Co.
Rockford, Ill.


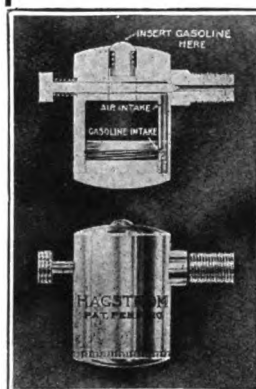


Fig. 386

The Hagstrom Suction Primer —OR— Auxiliary Cold Weather Starter

Vaporizes the fuel like a carburetor. Starts your engine in zero weather on first turn-over of motor.



Differs from priming spark plugs, pet cocks, etc., in that it does not ruin the cylinder by introducing the fuel in its liquid form.

Easily attached to intake manifold—one for each two cylinders. The intake stroke of the piston simultaneously sucks in the air and fuel, creating a perfect mixture.

Almost indispensable on small cars, motorcycles and motor boats.

\$1.50 Each

INTRODUCTORY OFFER

Get your order in at once for the number you require, remitting by money order, and we'll send them to you *transportation paid*.

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A 100% DIVIDEND IN 90 DAYS

That is what nearly every owner of an Imperial Gasoline Gauge will tell you was the result of his investment in an Imperial.



What You Can Expect From An IMPERIAL GAUGE.

It will give you the accurate capacity of your gas tank. It will detect slow leaks that may be wasting gallons of gasoline daily or weekly.

With it you can tell when your carburetor is flooding and wasting fuel.

It will enable you to keep a check on your engine so you will know when you are getting the proper mileage per gallon.

When purchasing gasoline, it will measure it accurately for you.

It eliminates your troubles of measuring your gasoline supply with a stick, removing tank cap, and other inconveniences.

It will also tell you accurately the amount of gasoline you have in your gas tank.

When you own an Imperial Gasoline Gauge you will learn to drive your car so as to get the greatest maximum mileage per gallon, AND WHY?

Because it enables you to keep in accurate touch with the operative condition of your car.

YES, THE IMPERIAL WILL FIT YOUR CAR, NO MATTER WHAT MAKE.

WHEN ORDERING simply state Name and Model, also style of finish, Polished Brass, Black or Bright Nickel.

The Imperial Gasoline Gauge can be installed by anyone, we furnish complete directions, also all parts and connections necessary.

We prepay express anywhere in the United States and Canada.

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If so, demand that an Imperial Gasoline Gauge made at Canton, O., be part of the equipment. Many manufacturers have already adopted it.

DEALERS, order your cars equipped with an Imperial, it means added selling argument for you and satisfaction for your customers.

Agents Wanted. Special Prices to Dealers.

Send immediately for descriptive circulars and price.

THE IMPERIAL FLUID GAUGE CO.,
344 EAST 8TH STREET, CANTON, O.

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"GRIFFITH'S IMPROVED." GUARANTEED 3500 MILES.

Comes with Full Corrugated White Tread.
Have the good points of all other makes incorporated in them.

Sold at about 1/4 off new APRIL STANDARD list.

Clinchers, Dunlops and Q. D. Clinchers.

Prices Guaranteed	Sizes	Independent Tubes Guaranteed
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16 52	32 x 3 1/2	3 25
17 64	34 x 3 1/2	3 46
20 80	30 x 4	4 00
22 38	32 x 4	4 21
23 55	34 x 4	4 46
25 52	36 x 4	4 69
30 35	34 x 4 1/2	5 52
32 20	36 x 4 1/2	5 81
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Goods Shipped with examination privilege. Money refunded on goods returned intact within a week.

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With that tread-worn tire of yours as a foundation, we can build you a puncture-proof and non-skid casing, which ought to give you from 1,000 to 2,000 miles more service than your new tires would be good for.

The secret of Triple Tread Success lies in the fact that the Triple Tread affords perfect protection to the fabric carcass and positively keeps out all water, which causes rotting. Rubber treads cannot do this—detachable rubber or leather treads cannot do it—inside linings cannot do it. **Nothing but chrome leather, vulcanized to your tires in the Triple Tread way, can do it.**

Chrome leather, re-inforced by steel studs, is the only thing tough enough, waterproof and pliable enough to make a better and more

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PUNCTURE PROOF SKID PROOF GUARANTEED

Let us Triple Tread just one of your tires now for a trial. The best time to act is while your car is laid up for the winter. Don't wait till you are ready to take the car out in the Spring.



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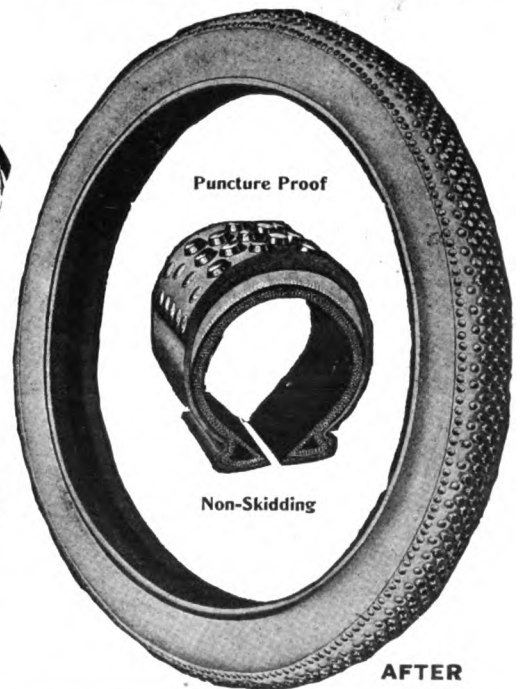
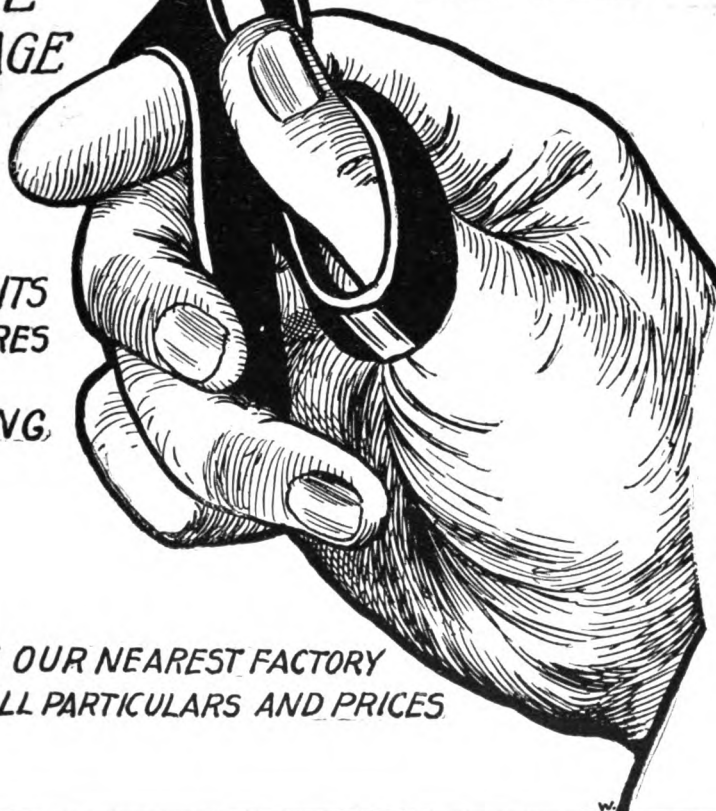
The TRIPLE TREAD

CUT YOUR TIRE BILLS

DOUBLES
TIRE
MILEAGE

PREVENTS
PUNCTURES
AND
SKIDDING

WRITE OUR NEAREST FACTORY
FOR FULL PARTICULARS AND PRICES



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**A
Quick
Repair**

Increases Mileage Cuts Tire Cost

Neglect of tires is more costly than wear. If you mend the small holes as soon as discovered you will greatly reduce your tire bills.

For repairing slits, cuts, bruises, blow-outs and punctures in casings, or in fact for permanent repairs for any injury that may happen to your tubes or casings, nothing equals an

M. & M. CEMENT-DOH OUTFIT

Sent Prepaid for \$1.25 Complete

Anyone can use an M. & M. Cement-Doh outfit.

It contains everything necessary to make a complete repair of sand pockets or casings where the carcass is exposed. The M. & M. way is much better, much cheaper, much quicker and much safer than heat vulcanizing.

If your dealer can't supply you with an M. & M. outfit, send us \$1.25 and we will forward the outfit direct to you. Your money will be returned if you are not satisfied.

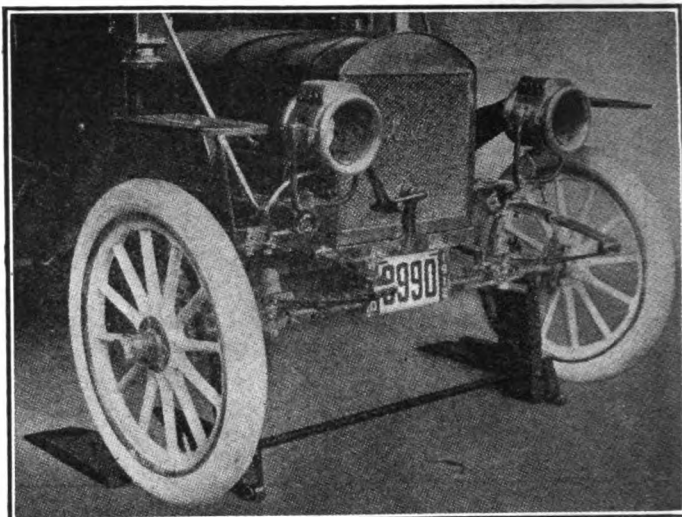


Our Free Booklet
"Money Saving Facts"
will be sent to all users
of tires upon request.

The M. & M. MFG. CO.
Dept. C
Akron, Ohio

**PRICE-
COMPLETE
\$1.25**

**for
Every
Tire
Tear**



SAVE YOUR TIRES

BY USING

HART'S Automatic Adjustable Auto-Jack

Send for Catalog A. **AGENTS WANTED.**

For circulars telling you all about it ADDRESS

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makes automobile chains, both riveted and detachable—
all sizes in stock.

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We carry in stock Sprockets for the following cars: Cadillac, Reo, Buick, Brush, Chase Motor Trucks, and all standard commercial cars.

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The Brown Impulse Tire Pump for 1913 requires no spark plug wrench. A quarter turn and the core of the plug is out—another quarter turn and the pump is in—no delay—no trouble—no broken spark plugs—a wonderful improvement.

The Brown 1913 Pump includes 12 feet of tubing, high grade recording gauge, self-opening valve connection and a special spark plug as part of its regular equipment.

Price complete—\$15.00.

Old Brown Pumps made over to fit this new connection, \$2.00 including spark plug.

Extra spark plugs \$1.50 each.

Ask your dealer or write us for full information.

THE BROWN COMPANY

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HESS-BRIGHT BALL BEARINGS



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Do Not Varnish Your Car

VANITY DUSTER, a Liquid Applied With a Cloth, Will Clean, Renew and Polish it In One Operation, bringing out its original finish, making your car look like new.

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WILL EARN ITS COST IN ONE DAY'S USE.

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TWO SIZES } Capacity of small size up to 3/32 inch wire. Price \$1.00
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 Special size up to 5/16 inch wire. Price \$3.00

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WELDING AUTOMOBILE PARTS



Cracked or Broken

Cylinders, Crank Shafts, Crank Cases, Housings, Frames, Axles, any metals of any shapes or thicknesses, including

ALUMINUM PARTS

All work absolutely **GUARANTEED**

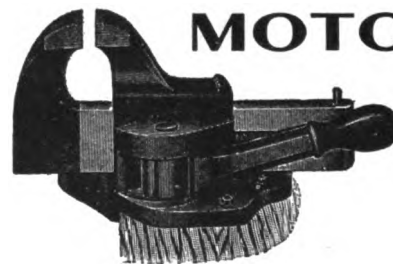
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 Write for estimates.

Complete Oxy-acetylene Welding and Cutting Plants installed.

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We Have It!
 You Want It!
 What Is It?

A Reliable Quick Acting Vise

EAGLE ANVIL WORKS

FISHER & NORRIS

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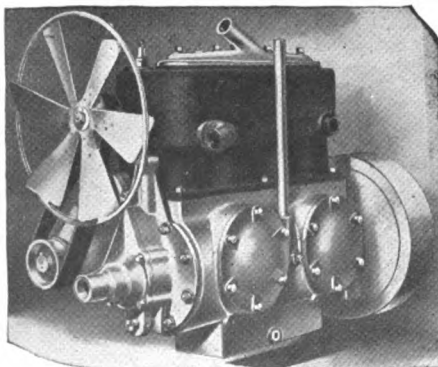
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Manufacturers, Look!

Why use opposed motors when you can buy this four-cylinder, silent, powerful and absolutely reliable motor for the same price? 16 H. P., 3 1/4-in. x 4-in. En Bloc. Four Cylinder.

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KING OF REINFORCEMENTS

Guaranteed 10,000 miles—2 years.

The "Pacemaker" reinforcements are puncture and blow-out proof. They are guaranteed not to buckle, creep, or affect the resiliency of the tire. They have no metal in their construction, are self-vulcanizing, and can be used in several different casings.

Write at once for descriptive circular and price list.

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THE AUTO TIRE BROKERAGE COMPANY
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25%
Fuel Saving

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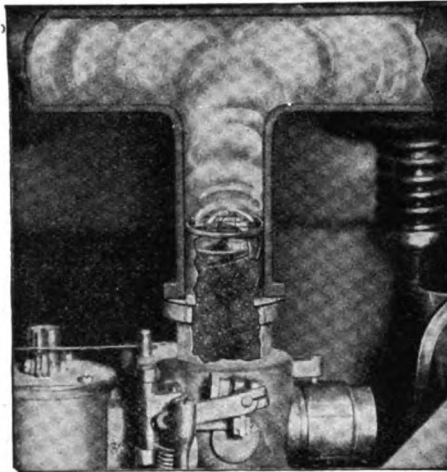
100%
Better Flexibility

No Moving Parts
Needs No Attention

COAL broken into fine particles makes more perfect combustion and gives greater energy. So does gasoline when passed thru Mondex-Helix.

12% increase at 25 miles per hour.

Increased Power on Hills.



4% increase at maximum speed.

50% increase at 10 miles per hour.

Note how the Mondex-Helix inserted in entrance of intake pipe first twists and then grates the lumpy gas into a swirling vapory mass.

Everywhere on
High Gear

EVEN COMBUSTION DOES IT

Sizes for any Carburetor will be sent by mail with full instructions on receipt of price. 1 in. to 1 1/2 in., \$3.00; 1 1/2 in. to 2 in., \$4.00.

Silent Motor
and Smooth Pull

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"Big Six"



A. L. A. M.



"Big Seven"

"Thin Six"
For lighter service"Thin Seven"
For lighter service


Why do manufacturers' quotations on wrenches vary, so greatly! The answer is, they don't! No specification which you or anybody else ever made has been complete. All the prices you ever received on wrenches differed only on the thing

*You
didn't specify—
Williams'*



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You do specify sizes precisely; everything else should be quality.

Our interests are mutual; for an illustration of the most extensive, dependable line of stock Drop-forged tools and Gas Engine Forgings allow us to send to you free a copy of just out pocket edition catalogue. Go to your dealer for  service.

J. H. WILLIAMS & CO.

Superior Drop-Forgings

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Chicago Office and Warehouse
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LEAK-PROOF Piston Rings



If you are not using "Leak-Proof"—you are not using the better ring.

"Leak-Proof" RINGS are not the lowest priced rings you can buy but they are positively the best, and will prove cheaper in the long run.

Why experiment with the cheaper and inferior rings when you can buy "Leak-Proof" RINGS, that can always be depended upon?

The tens of thousands of "Leak-Proof" RINGS in use and giving satisfaction are testimonials of their efficiency. We want to reach those

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To save money—to increase power—to decrease carbonizing—to save fuel—that is why tens of thousands of "Leak-Proof" PISTON RINGS are in use to-day.

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THE AUTOMATIC AIR CHUCK. No. 47.



**EDELMANN
AIR-CHUCK**

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Chuck is entirely Automatic. To operate, simply slip connection over Tire Valve and press downward. When Tire is sufficiently inflated you remove from Tire Valve and Air Chuck shuts off automatically.

PRICE, \$1.00

No. 104 GREASE CUP

Thread $\frac{1}{8}$ " Pipe

Polished Brass,
40 cents

Nickel Plate,
50 cents

Size is equal to No. 00



TIRE GAUGES



No. 1 Edelmenn Tire Gauge

Holds the Indication
Guaranteed
correct within
2 per cent.

To operate simply
remove valve cap and
press Gauge over tire
valve.

The red hand re-
mains at the maxi-
mum pressure until
re-set by hand.

Price, \$1.50

No. 3 Edelmenn Tire Pump Gauge

Fits any make
of Pump. Can
be used as a
Tire Tester, or
Pump Gauge.

Price, \$2.00

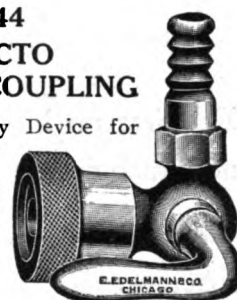


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A Very Handy Device for
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Shut off the
Air at the Tire
First.

Price, 50c.

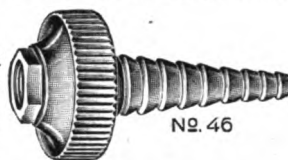


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A Heavy
Substantial
Connection
for Air Hose.

Note the
Construction.

Price, 25c.



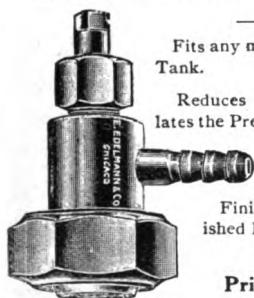
PRESTO REDUCER

Fits any make of Gas
Tank.

Reduces and Regu-
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Finished in Pol-
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Price, 75c.



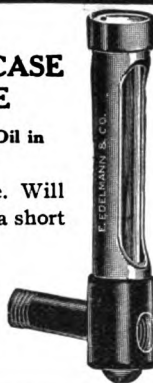
No. 41 FORD CRANK CASE OIL GAUGE

Indicates the Level of Oil in
Crank Case

A very useful device. Will
save its cost in oil in a short
time.

Attach in Place of
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on Crank Case.

Price, 75c.

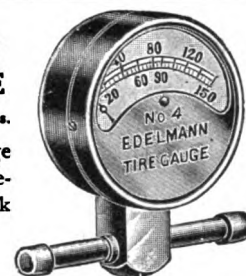


No. 4 EDELMAUNN PUMP GAUGE

For use on Power Pumps.

This is a Gauge
for use in hose-
lines, and for Spark
Plug Pumps.

Price, \$1.25



No. 101 GREASE CUP

Right Size for Spring Shackle Bolts.

No. 101, with $\frac{1}{4}$ thread.....20c

No. 102, with $\frac{5}{16} \times 32$ thread.....20c

No. 103, with $\frac{1}{4} \times 32$ thread.....20c

Larger sizes, No. 104, No. 110



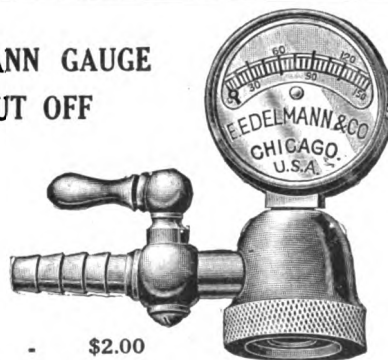
ANY ARTICLE WILL BE SENT BY PREPAID MAIL
ANYWHERE IN UNITED STATES OR CANADA
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No. 5 EDELMANN GAUGE WITH SHUT OFF

ACCURATE

DURABLE

PRICE, . . . \$2.00



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BE YOUR OWN REPAIRMAN



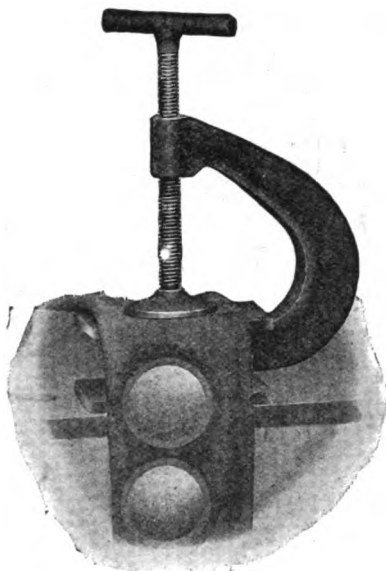
**You can Repair a Puncture
for 2 Cents
CAN BE DONE IN 4 MINUTES**



Inner Tube Patching Clamp

Requires no Heat and no Acid which destroys the tube.

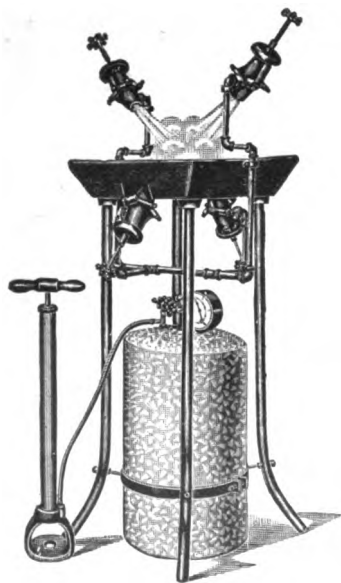
This machine simply welds Rubber to Rubber with a cold process.



Inner Tubes repaired in this way should last at least 5 years.

Agents wanted in every town and city. \$5.00 to \$10.00 per day for **LIVE WIRES**.

No. 3 Brazing Forge



**Most Powerful Forges
in the World.**

**4 sizes for all kinds
of work.**

(Patents applied for.)

Brazing Spelter



Highest Quality.

Manufacturers of High Grade Rubber Cements

for the
AUTO, MOTORCYCLE and BICYCLE TRADES.

We are shipping to every State in the Union. We have a reputation.

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Send for Catalogue and Prices.

Address DEPT. A,

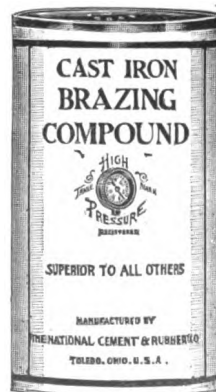
**THE NATIONAL
CEMENT & RUBBER CO.**

TOLEDO, OHIO, U. S. A.



No scales on your work.

**BEST
EVER
MADE.**





This cast Iron Brazing Compound needs no spelter.

It does the work all by itself.

SEND US YOUR WORN-OUT ANNULAR BALL BEARINGS



We Will
Regrind and
Make Them
as Good as
New  

We regrind all kinds of Annular Bearings. Also carry a complete stock of S. R. B. Annular and Thrust and New Departure Double Row and Radax Bearings. We have a large stock of reground bearings on hand for immediate exchange, both at Chicago and New York. We can fit you up no matter what your bearing troubles are. All sizes high grade steel balls in stock.

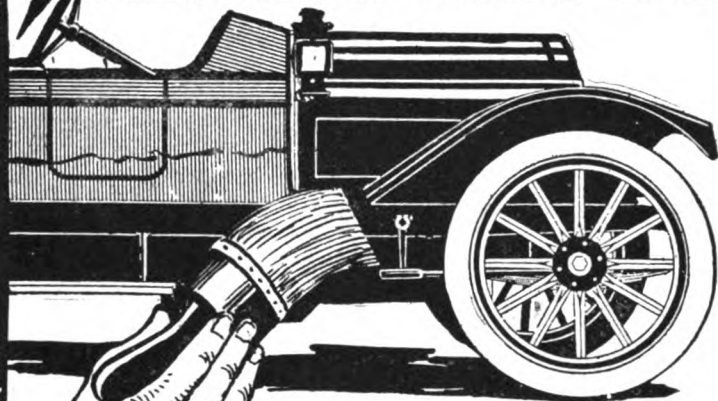
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**YOU CAN DO IT AND
SAVE \$25 to \$75**

**Any one can use our materials.
You don't need previous experience.**

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ARSENAL VELVET GLOSS is made in the following colors: French Gray, Battleship Gray, Ebony Black and Apple Green, and in two sizes of outfits. No. 1, sufficient for cars like the Hupmobile, Ford, etc., costs \$5, and No. 2, for larger cars, costs \$7. Order an outfit to-day and paint your car yourself.

THE ARSENAL SYSTEM of repainting motor cars (for novices) should be used by those desiring a high gloss finish. It is in three coats ready mixed for use, together with proper brushes and full instructions. The Arsenal system is made in the following colors: Red, Maroon, Green, French Gray, Battleship Gray, Orange, Cream, Apple Green, Black, two shades of Blue, and Brown. There are three sizes of outfits: No. 1 for small runabouts, costing \$7; No. 2, for Model T Fords and small touring cars, costing \$8, and No. 3, for large touring cars, costing \$9. If two colors are desired—that is, the body one color and the wheels another—add 75 cents to cost of each outfit. Hundreds of car owners have saved thousands of dollars by doing their own painting with the Arsenal system.

HOOD AND FENDER OUTFITS. A great many cars have the hoods and fenders enamelled black regardless of the body color of the car. We make outfits for this purpose in two coats and one color only, black. No. 1 outfit is \$2.75; No. 2 is \$3.75, and No. 3, \$5.00.

MOHAIR TOP DRESSING

ARSENAL MOHAIR TOP DRESSING is the most satisfactory dressing for Mohair on the market. One coat will renew the faded Mohair and stop the leaks. Price, quarts, \$1.50; pints, 80 cents.

ARSENAL BLACK ENAMEL TOP DRESSING is for leather and imitation leather, such as pantasote, etc. Is also a good leather dressing for black upholstery. Price, quarts, \$1.50; pints, 80 cents.

ARSENAL LEATHERNEW is a clear leather dressing for colored upholstery and is a good dressing for colored top if of leather or imitation leather. Price, quarts, \$1.50; pints, 80 cents.

Enamelled Lamps the Style for 1913

ARSENAL LIQUID GUN METAL is the only air-drying brass enamel of proven merit on the market. Is has proven its worth on thousands of cars during the past four years.

Liquid Gun Metal is also made in all the colors of the Arsenal System. Invaluable for enameling the motor, or touching up scratched or marred places when repainting is not necessary.

Arsenal Liquid Gun Metal is for sale by leading dealers everywhere, but if yours does not have it in stock, we will forward a can, express prepaid, on receipt of \$1 (in the U.S. only).

ARSENAL LIQUID SILVER will positively silver-plate brass or copper, quicker and with less labor than any similar material. From two to five minutes is all the time required. It is a satisfactory polish for nickel as well. Price, \$1.00. The popular style is enamelled lamps with silver-plated trimmings. A can of Liquid Gun Metal and a bottle of Liquid Silver enables you to do over your brass in the prevailing style, and we will send both by prepaid express, for \$1.75.

ARSENAL LIQUID RUBBER is a preserving and beautifying tire coating. Liquid Rubber is pure Para gum in solution. Contains so much rubber that it can only be made in natural tire gray. Pints (16 oz.), 55c. Qts., \$1.

Our booklet—"The Car Beautiful"—describes these materials in detail, and is the only work of its kind published. Send for it to-day. It is free.

ARSENAL VARNISH CO.,
2501 Fourth Avenue **ROCK ISLAND, ILL.**
Specialists for Motorists



4
ABSOLUTE NECESSITIES



REX

INCONCEIVABLY DELICATE

NICKEL POLISH

SAVES YOUR EXPENSIVE NICKEL PLATING

Made especially for cleaning and repolishing NICKEL PLATING, NICKEL PLATED LAMPS, GERMAN SILVER REFLECTORS, and all German Silver and NICKEL PLATED ACCESSORIES.

Composed of pure neutral oils, and fine abrasives obtained by collecting the dust arising from our milling machines. Contains no Ammonia, Acid or Grit. Never settles in the can, the fine abrasives remaining always in suspension.

NOTE.—Not intended for quick, easy removal of heavy tarnish, but to **save nickel plating** while keeping it in fine satin finish from the time it is new, or after it is put in condition from heavy tarnish or oxide, by use of

REX METAL CREAM POLISH

The “superlative degree” in metal polish for GENERAL USE on BRASS, COPPER, STEEL, Etc.

Contains no acid or grit to injure. Does not leave that “vulgar white shine” so common to metal polishes, but brings out the rich natural lustre of the metal itself, leaving the surface of the metal BURNISHED and RESPLENDENT.

NEVER SETTLES SOLID IN THE CAN.

Made by the manufacturers of the

ALWAYS DEPENDABLE, EVER SATISFYING

REX STAPLES:

REX WOOD OIL for repolishing Automobile Bodies, Hardwood and Furniture, and

REX LEATHER DRESSING, the black waterproof finish for Tops of Autos and Carriages; Leather, Mohair, Pantasote, Canvas, Repair Work, etc.

LARGE SIZE CANS OF REX STAPLES SOLD BY ALL DEALERS IN AUTO SUPPLIES.

SMALLER HOUSEHOLD SIZES at all first-class HARDWARE, GROCERY and DRUG STORES.

Write for Full Information.

ARMIGER CHEMICAL CO., Chicago, U. S. A.

\$1.50

The "Peerless" Vulcanizer

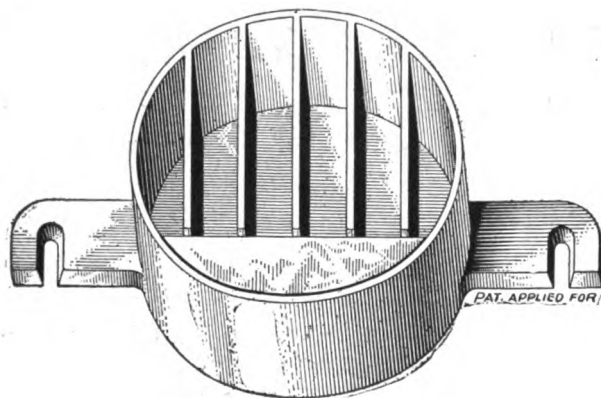
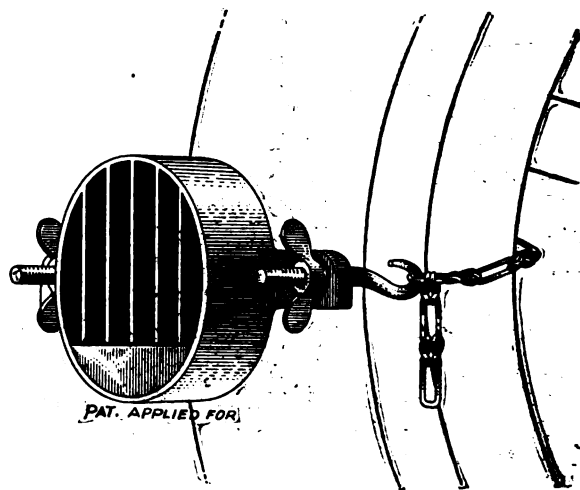
Just think—what your Repairman would charge \$1.00 for, You can do for 5c.

It will do anything that any ordinary Vulcanizer will do.

Perfectly reliable, cannot burn, scorch or over-cure your tire.

We send these vulcanizers to you with a guarantee so broad that competitors cannot possibly meet the requirements—

Your money back if it does not make good in every particular.



Don't neglect your tires. Those little, insignificant cuts admit the sand and water. With every revolution of the wheel the sand works in farther and farther until it reaches the fabric; loosens the rubber from the fabric in all directions. The water rots that fabric and weakens it until it cannot longer support the inner tube. Then "BANG" and you have a blowout.

Such a mishap could never occur if you had a "PEERLESS" Automatic Vulcanizer and used it before the cut or crack got to the "Danger Point." It is the best Automatic Vulcanizer in the world. Covers a space four inches in diameter and does its work absolutely perfect.

You put the rubber patch over the hole or cut on your inner tube. Attach the vulcanizer. Throw in an ounce of gasoline or alcohol and light it with a match, and in less than fifteen minutes the job is finished. Works entirely automatic.

If you cannot get a "PEERLESS" of your local dealer, send us the price and we will send the outfit by return express, ALL charges prepaid. \$1.50, right at your nearest Express office. Also with enough repair material to make from 20 to 40 patches.

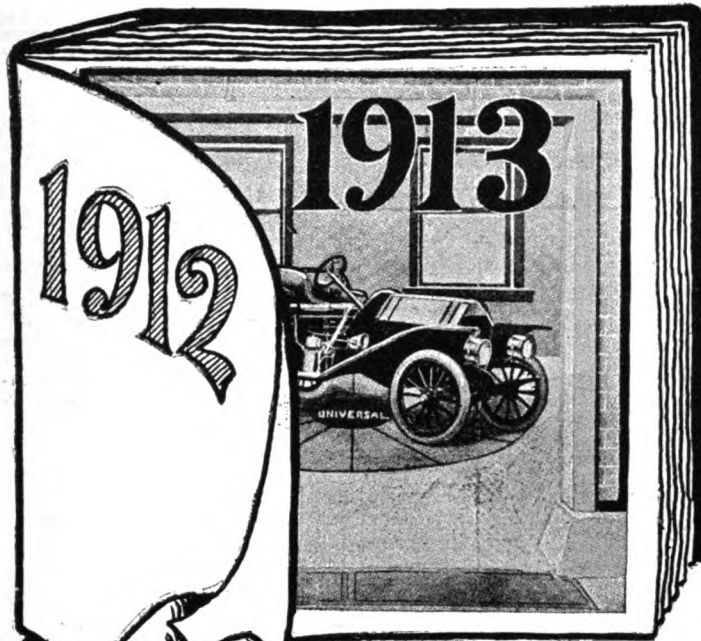
Dealers Supplied.

THE LEADER MANUFACTURING CO.

3049 West 25th Street,

Cleveland, Ohio.

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*When You
Come To
the "Turning"
Point.*

**And You are Looking for
the "Easiest Way" to "Turn"
THEN—it is time to Investigate
the "UNIVERSAL" Auto Turntable**

You can start the new year with less trouble, less expense, less friction.

With the "Universal" you get greater strength and durability. You can turn the heaviest truck or touring car, and so easily that a 12 year old child can do it.

WE ASK YOU TO CONSIDER the "Serpentine" Ball Bearing Race Course. This is the solution of the Anti-Friction problem, which other patterns have failed to overcome. This construction has reduced friction over 50% less than any other table.

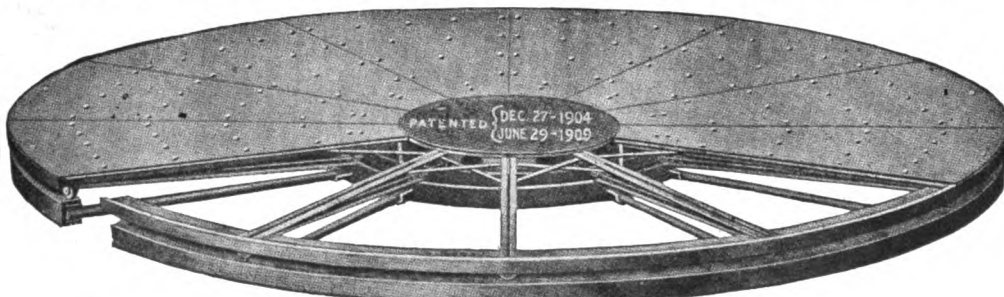
Tables of all diameters require a pit twelve inches in depth to contain each. It is possible to place the "Universal" on upper floors.

Made in four sizes—a size for every use and every car. Get our Catalog "C-10" on "Universal" Garage Equipment. Send to-day; you need it.

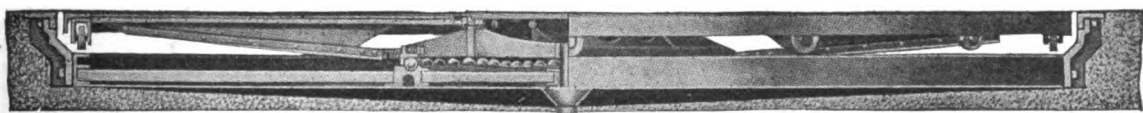
Ask us about our Auto-Jack and Emergency Truck, and "The handiest Tool in the shop," Portable floor crane and hoist—two other great garage conveniences.

SEND FOR COMPLETE LITERATURE.

THE CANTON FOUNDRY & MACHINE CO., Canton, Ohio.



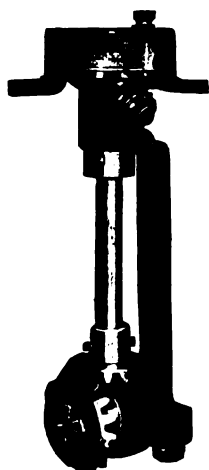
TOTAL DEPTH 12-IN.



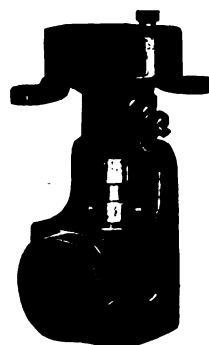
CONCRETE ANY DEPTH AND GROOVED TO WATER DRAIN

Please mention the Automobile Dealer and Repairer when writing to advertisers.

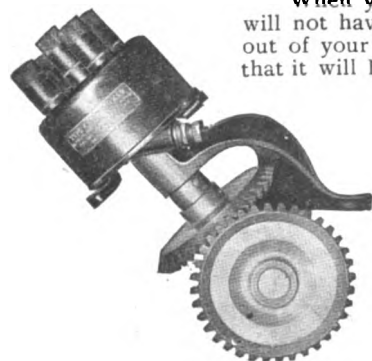
The Atwater Kent Ignition System



For 2-Cylinder Maxwell Cars Prior to 1909 Models.



For 2-Cylinder Buick Cars Prior to 1909 Models.



For Ford Models N, R and S.

has been on the market for the past seven years, during which time over seventy-five thousand have been used with universal satisfaction and the demand is steadily growing among discriminating car owners who require the best ignition obtainable.

The Atwater Kent System embodies the best features of both magneto and battery—in fact, it gives magneto results with a battery system without the weaknesses of either, at less than one-half the cost of a good magneto.

The Atwater Kent System can be easily installed on any standard make of motor, new or old, by substituting the Unisparker for the regular timer on the timer shaft of the engine. To meet a large demand for its use on cars where it is impossible to place the Unisparker directly on the timer shaft, such as the various model Fords, Franklins, 2-cylinder Buicks and Maxwells, we have designed special gears and brackets which enable the installation to be easily and quickly made with little or no machine work. During the past season we have furnished several thousand of these equipments, enabling the owners of the above cars to have an ignition system equal to that found in the highest-priced car.

Due to the steadily increasing demand for the Atwater Kent Ignition System we have increased our manufacturing facilities, enabling us to manufacture this equipment in such quantities that the cost of efficient factory operation can be reduced to the minimum, and we herewith announce to the trade and the motoring public the following reductions in price of our Type F system.

Prices of the Type F Atwater Kent Ignition System

	Standard Coil Box	Kick Switch Coil Box
1-cylinder.....	\$17.00	.....
2-cylinder opposed.....	18.00	.....
2-cylinder distributor type.....	22.00	\$24.00
3-cylinder.....	25.00	27.00
4-cylinder.....	25.00	27.00
6-cylinder.....	27.00	29.00

The price of the different gear sets illustrated herewith is \$3.00 each in addition to the above prices.

In substituting the Atwater Kent System for the magneto, a special magneto gear mounting is required, illustrated herewith, the price of which is \$5.00 in addition to the above prices.

When you install the Atwater Kent, you do not need an expert and will not have to worry about your ignition. You can be sure it will get out of your motor all the speed and flexibility the maker put into it and that it will last as long as the motor.

Perhaps your present car only needs an Atwater Kent Ignition System to enable it to give you perfect service—anyhow you should have a copy of our booklet "G," full of ignition facts—it's interesting and it's free.

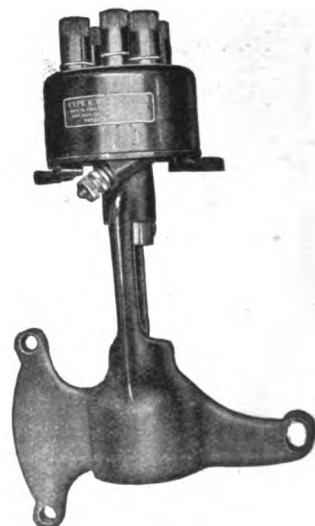
ATWATER KENT MFG. WORKS

4933 Stenton Avenue, PHILADELPHIA

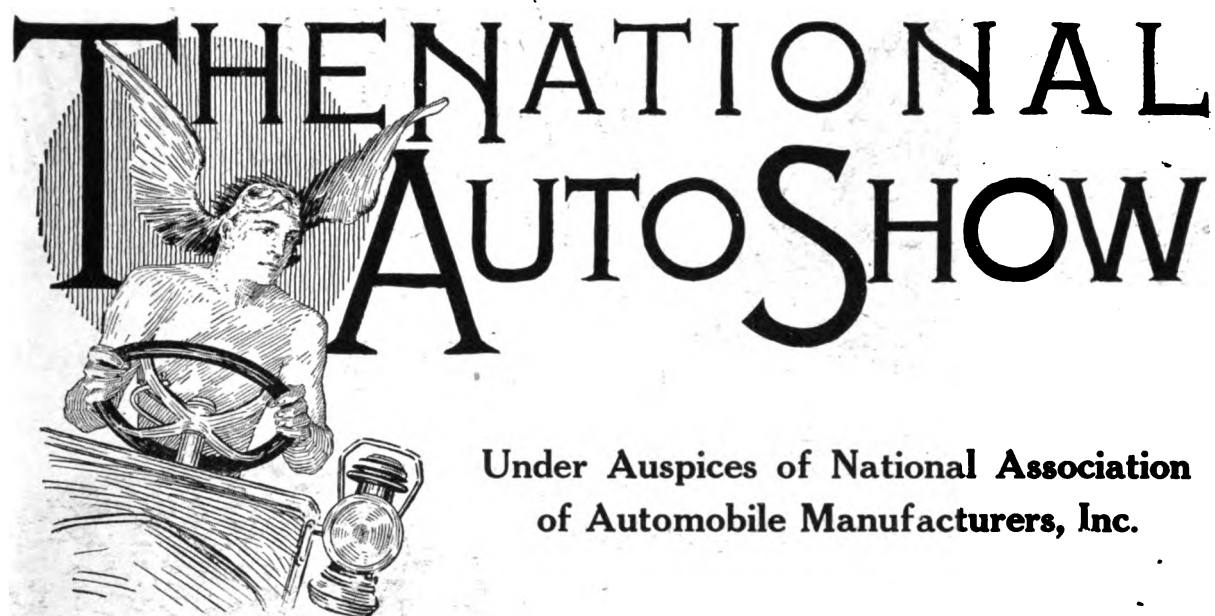
Magneto Gear Mounting for installing the Atwater Kent System in place of magneto.



For 1905, 1906, 1907 Models Franklin Cars.



For Ford Cars, Model T, also 1911, 1912 and 1913.



Under Auspices of National Association
of Automobile Manufacturers, Inc.

At CHICAGO

Coliseum and 1st Regiment Armory

February 1 to 8

Passenger Vehicles

Parts and Accessories

February 10 to 15

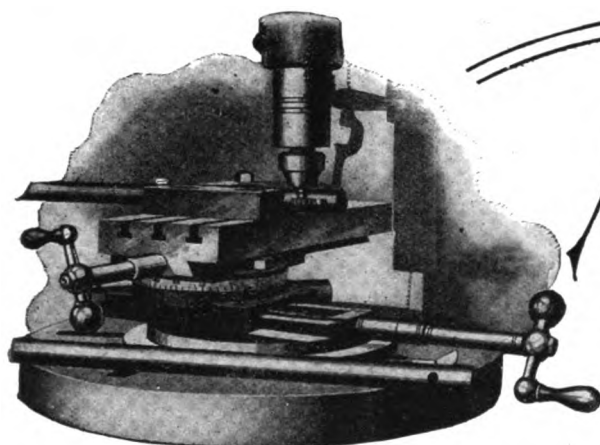
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The Entire Trade, in One Comprehensive Exhibition,
For the Thirteenth Consecutive Season

S. A. MILES, Manager

Auditorium Hotel, Chicago



"Davis" The Milling Attachment and Compound Table

JUST WHAT YOU'VE BEEN LOOKING FOR.

The "Davis" Milling Attachment can be attached to any upright drill press of any size from 14" to 42" swing, in two minutes' time. It enables you to convert your drill into a first class vertical milling machine that will do 90% of the lighter jobs as well as the high priced machines.

The "Davis" Milling Attachment is invaluable to any shop, large or small. In the big shop, no matter if you have a dozen large millers, it will come handy when they are tied up with work, for milling of ends of bosses, spotting castings, etc. In the small shop that cannot afford a vertical milling machine, or when the amount of work does not justify the expense of a regular milling machine.

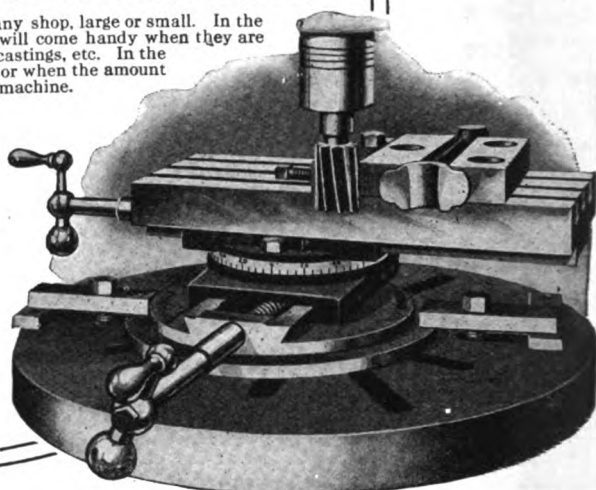
The "Davis" Milling Attachment

A TOOL OF REAL MERIT

It cuts keyseats, straight or taper, cuts the "Woodruff" or half-moon keyseats perfectly, mills deep grooves or slots, cuts jaws and mills cams.

For the diemaker, pattern maker, general repair shops and the automobile garage.

The Hinckley Machine Works
Hinckley, Ill.



K&W RELINERS

The Fabric is the Life of Your Tire

EVERY MOTORIST KNOWS

that tires grow weaker with each day's use and age till they finally blow out at the weakest place.

First—Prevent deterioration by age and road travel.

Second—Make the weakest point in your old tires **STILL STRONGER** than a new tire.

The Secret of Long Life

To Do This place K & W Patent Reliners in your tires. They make it too thick for tacks to reach the inner tube, while nails, bolts or spikes after passing through the tire, coming in contact with the reliner are invariably turned aside.

By reinforcing the fabric with K & W RELINERS you get many additional miles of service, besides making punctures and blow-outs impossible. K & W Reliners will easily reduce your tire expense 50 per cent.

When placed in an old casing a K & W practically vulcanizes itself to the inner fabric and covers up all the cracks and worn spots; reinforces the whole tire in exactly the same way that an inside blow-out patch reinforces one weak spot.

The exclusive features found in K & W Reliners are fully covered by patents and **cannot be found in any other reliner made.** Every K & W Patented Reliner is backed by our positive guarantee of service and satisfaction.

Write for our K & W Tire Accessory Catalog, containing prices of our "Patent" Reliners.

See your dealer—if he does not sell K & W PRODUCTS, **write us** for a special price.

DANDY RELINERS—We make this kind for those who want a low priced tire reinforcement. If you do not want the K & W highest quality, this reliner will answer the purpose of "Price," and the quality is as good as any other reliner on the market.

K & W MANUFACTURING COMPANY

Denver Branch: 1545 Broadway, Denver, Colo. MAIN OFFICE AND FACTORY: 3rd St., Ashland, Ohio.
Cleveland Branch: 2362 Euclid Ave., Cleveland, Ohio.



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13,055 Magnetos Shipped in October.

13,165 Magnetos Shipped in November.

1913 sees more Remy Magnetos in use than all others combined

MORE than three hundred of the most representative organizations in the entire automobile industry chose the Remy Magneto exclusively for 1913.

More than three hundred of the greatest engineers in the industry gave this action their stamp of approval.

More than ten thousand dealers were previously consulted by the manufacturers.

More than three hundred thousand satisfied users of Remy Magnetos during 15 years gave volume to this tidal wave of demand for the Remy Magneto for 1913.

And the many years of Remy success is emphasized in the 1913 season, when the greatest attention is being paid to choice of equipment.

Are these facts significant to you

The Remy Electric Company is the pioneer manufacturer of magnetos in this country - one of the first in the world.

It is the world's largest manufacturer of magnetos.

It created "Ignition Service."

We have more than fifty branches and service stations in North American motoring centers for intelligent service to Remy users.

More than 1,000 men are employed to build Remys.

This great force facilitates construction and deliveries with scientific, automatic,

time-saving, accurate machines—protected by a fire-proof factory.

These men are electrical and mechanical experts drawn from every civilized country of the globe.

The Remy Electric Company has as a result of its tremendous volume greater buying facilities than any other ignition concern.

These facts, combined with the simplicity of the Remy construction, make it logical for the Remy Electric Company to offer the best motor car electrical equipment for the lowest legitimate cost.

See the Remy Electric

Starting, Lighting and Ignition Exhibit

Space 66, Coliseum Balcony, Chicago Show.

Remy Electric Company, Anderson, Indiana.

Service Stations

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Atlanta, Ga.
Baltimore, Md.
Boston, Mass.
Buffalo, N. Y.
Charlotte, N. C.
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Cleveland, Ohio.
Chicago, Ill.
Columbus, Ohio.
Detroit, Mich.

Indianapolis, Ind.
New York City, N. Y.
Kansas City, Mo.
San Francisco, Cal.
Dallas, Texas.
Denver, Colo.
El Paso, Texas.
Grand Rapids, Mich.
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Jacksonville, Fla.
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Please mention the Automobile Dealer and Repairer when writing to advertisers.

STOP THAT BLOWOUT

If Your Tire
Has a Bulge
In It, a Blow-out
Is Threatening—



THE APPLICATION OF A "UNIVERSAL" BOOT WILL PREVENT IT. With the "UNIVERSAL" you can wear out your old casings, casings that have been badly cut, blown-out or that are in a weakened condition. NO DRIVER OF A CAR CAN AFFORD TO BE WITHOUT A "UNIVERSAL" QUICK REPAIR BOOT. Adaptable to all makes of tires and wheel rims.

Made in three types, they meet the needs and purse of every autoist.

THE "UNIVERSAL" REPAIR BOOT

is a real necessity. Can be applied quickly and will not slip or cuff away from the point of application. Sooner or later you will have weak, badly worn or rim cut tires and you will need this boot to prevent a blow-out.

Every autoist should have one.

Every dealer should handle it.

We have an interesting sales proposition for dealers.

If you want a big seller, write today for full information.

UNIVERSAL TIRE PROTECTOR CO.

Box 587

Angola, Indiana.

"ALL

The one
SPARK PLUG
that gives
Perfect
Satisfaction

POWERFUL
SOOTLESS
DURABLE

PERFECT
IGNITION

FITS ANY
ENGINE

We shall prosecute vigorously all infringements now on the market, or any which may spring up in the future.



Plug
and
Priming
Cup

ONE"

Prime your motor
instantly

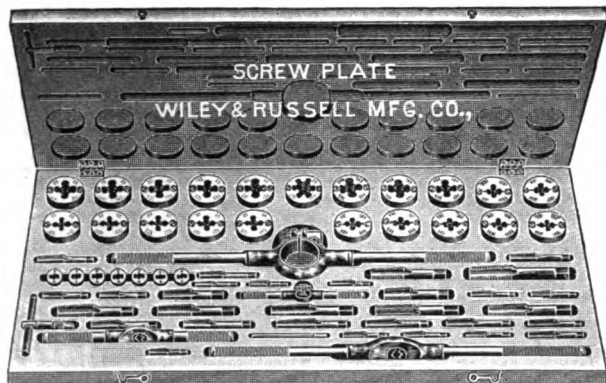
To clean the contact points, you simply pour gasoline into the priming cup and the carbon deposit is blown out into the air at each discharge of the motor.

A \$1.50 now will save you trouble and expense in future.

Frontier Specialty Company

732 Main St.

BUFFALO, N. Y., U. S. A.



Something You Want!

Special set comprising a tap and die for every size and thread used on Ford Model T Automobile; also a stock for every die, a wrench for every tap. Cased in a neat, special cabinet.

Also handy for any automobile.

Ask for Ford Model T Screw Plate.

Wiley & Russell Mfg. Co.
GREENFIELD, MASS.



APPLY THE BRAKE J-M NON-BURN GRIPS INSTANTLY

Locks wheels almost instantly! Think what this may mean to you in one of those tight places—a car ahead and one behind; ascending or descending a steep hill; nearing a railroad crossing; or going around a corner! If your brakes do not lock instantly in such emergencies, the destruction of your car and the maiming or killing of the occupants may be the result. You overcome this uncertainty when you line your brakes with

J-M Non-Burn Brake Lining

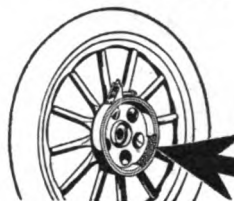
This brake lining is made from strands of pure Asbestos interwoven with strong brass wires. Its gripping power cannot be impaired by use because it cannot burn, char or unravel, and the action of oils, gases, water, grit or chemicals have no effect on J-M Non-Burn.

No matter how fast you are speeding, if your brakes are lined with J-M Non-Burn you can stop almost instantly in emergencies, yet gradually and smoothly when desired.

By actual test it **OUTWEARS TWELVE ORDINARY LININGS.** Sold by most dealers. Look for the name stamped on it.

Write nearest Branch for sample and booklet.

H. W. JOHNS-MANVILLE CO.



Albany	Detroit	New York
Baltimore	Indianapolis	Omaha
Boston	Kansas City	Philadelphia
Buffalo	Los Angeles	Pittsburgh
Chicago	Louisville	San Francisco
Cincinnati	Milwaukee	Seattle
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1552

Gurney Ball Bearing



Patents Pending

The **ONLY** ball bearing combining the following important features: Full complement of balls; continuous, unbroken and full depth raceways.

The bearing also has a non-wearable single piece ball separator. It is equal to the best in radial capacity and superior to all other annular ball bearings in thrust capacity. Ask about our **RADIO-THRUST** bearing. Made in standard sizes.

Interchangeable with all standard sizes.

Write for prices and catalog.

GURNEY BALL BEARING CO., Jamestown, N. Y.

The new Sign that means more \$ \$ for you



This is the mark of quality that counts—the sign by which you can quickly recognize the fastest-selling and most-profitable line of Automobile Accessories—novel, attractive rubber sundries that have turned hundreds of dollars into the cash drawers of representative Accessory Dealers.

Is there room in your till for some of these profits?

Then write for the 1913 Essex
Auto Sundry Booklet now.

ESSEX RUBBER COMPANY

Principal Office and Factory, TRENTON, N. J.

Q. D. RIM REMOVER

PATENTED AUG. 27, 1912.

Saves Time, Labor, Trouble
WHEN CHANGING TIRES



Hook the tool over the outer edge of tire rim, between the two ends of locking ring. Push valve stem into rim so that locking lug clears inside of Shoe. Screw the bead ring off locking ring. It holds the rings apart, leaving both hands free to remove the locking ring. Nickelled and case hardened, it weighs 2½ oz. If not carried by your dealer, mailed prepaid in the U. S. on receipt of 65c P. O. or EXPRESS MONEY ORDER, or 75c on check requiring collection charge.

WM. L. TOBEY - 12 Lewis Street,
EAST BOSTON, MASS.

DEALERS, WRITE FOR PRICE LIST



A. L. WESTGARD

The noted pathfinder writes that Dixon's Automobile Lubricants played an important part in his celebrated trip to the Pacific Coast.

"Lubricating The Motor" and
Sample No. 184-G on request.

JOSEPH DIXON CRUCIBLE CO.
Jersey City, N. J.



BILL ENDICOTT

Writes, "Car worked perfectly. All parts lubricated with Dixon's Automobile Lubricants in perfect shape after races (Indianapolis Sweepstakes)."

Write for "Lubricating The Motor" and sample No. 184-G
JOSEPH DIXON CRUCIBLE CO.
Jersey City, N. J.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

30% More Mileage



Save The Tires

Every automobile owner and every dealer has been interested in watching our National advertising of Tirenew. The big demand it has created means profit to the dealer.

TIRENEW

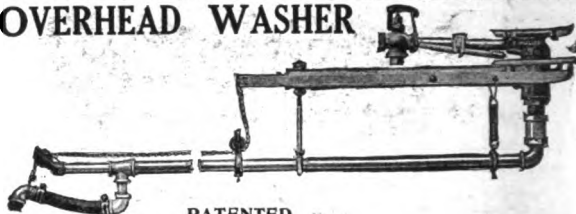
Prevents Tire Decay

is a liquid, unvulcanized rubber compound made with a base of pure gum—waterproofs and protects from oil, moisture, sun and air. **Makes Tires Look Like New.** There are imitations which paint but don't protect—insist on Tirenew. Send \$1.00 for a can—enough to Tirenew 8 tires. Ask about our other products:

Narco Rubber Reviver	Non-inflammable Rubber Cement	Leakanot, a liquid, rubber, waterproofing dressing for anything leather.
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NATIONAL RUBBER COMPANY, 4440 Papin St., St. Louis, Mo.

THE MULLER "RELIABLE" OVERHEAD WASHER



PATENTED

The Only Satisfactory Automatic Washer.

50 in use daily by Automobile Club of America for past two years; also by American and Adams Express Companies and most of the largest concerns in United States. We make eight different styles of washers. Ask your dealer or write us for full particulars. Manufacturers of movable electric light washstands.

Factory, 1344 John St.,
Gettysburg, N. J.

ED. MULLER

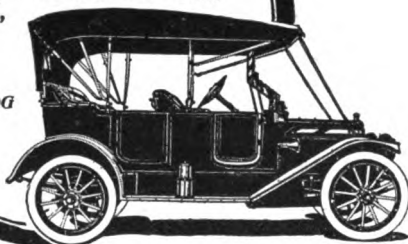
Office,
1777 Broadway, New York.
Phone 6729 Columbus

SELF SELLER

Get Our 1913 Agency Proposition.
WRITE US THIS MINUTE
It's all Velvet for the Agent.

W. H. McINTYRE CO.
AUBURN,
IND.

CATALOG
S



HANG ON TO YOUR OLD TIRES
THEY CAN BE USED FOREVER
WHEN COVERED WITH
STEEL



The Kimball Steel Protector makes Blow-outs, Punctures and Rim Cuts impossible. A few sections will hold any old blowout. Tires are as flexible as ever. Send for detailed information.
KIMBALL TIRE CASE CO., 174 Broadway, Council Bluffs, Iowa.

BADGER ACCESSORIES



Badger Side and Rear End Holder will take one or two tires or demountables of any size.

No. 1D.	Price, \$3.30
No. 2D.	" 4.80
No. 3D.	" 5.60

Write for our No. 4 Tire Holder Catalog and Discounts.

Running Board Holder, Patented Feb. 27, 1912.
Rear End " " Aug. 20, 1912.

AUTO PARTS MFG. CO., Milwaukee, Wis.

FOR AUTOMOBILE, MOTOR TRUCKS and TRACTORS

The PLANHARD is Unexcelled

Let us send you a carburetor for trial.

You'll want to keep it once you've studied its performance.

Write for literature.

THE PLANHARD MFG. CO.

1784 BROADWAY

NEW YORK

Factory: KOKOMO, IND.

Save TIME and MONEY

Automobile Truck Users.

Send your wheels that need repairing to

PHINEAS JONES & CO.,

Phones 1571 } Market.
1572 }

NEWARK, N. J.

Or to Branch Factory, 12th Ave. and 55th Street,

Phone 4926 Columbus.

NEW YORK CITY.

Full Equipment of the Latest and Best Machinery.

A Woman's World-Tour in a Motor.

Is the title of a book just published, which every motorist will enjoy reading.

Harriet White Fisher is the author, and some of the adventures as described in her book are of the hair-raising order.

It seems almost incredible that any woman should have deliberately invited the trouble she encountered, or should have been able to overcome them triumphantly and return to her home in Trenton, N. J., without a really serious accident.

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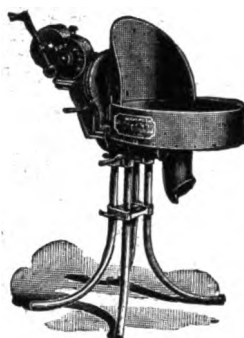


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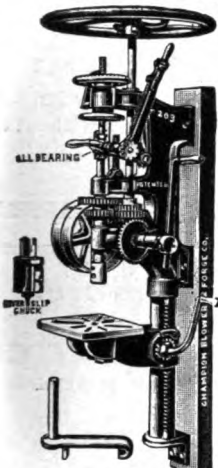


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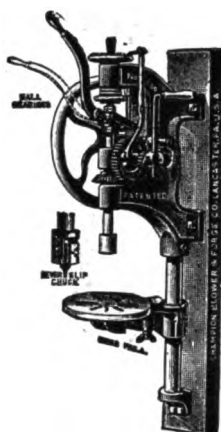
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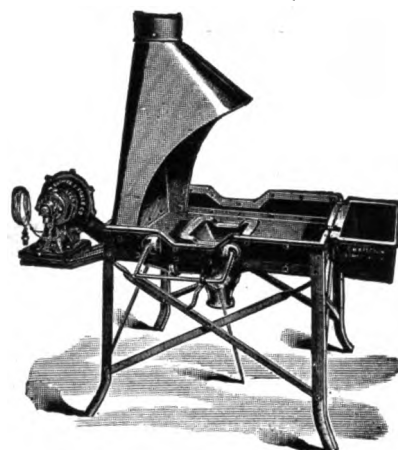
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A JOURNAL OF PRACTICAL MOTORING.

VOL. XIV, No. 5.

NEW YORK, JANUARY, 1913.

PRICE } 10c. PER COPY.
\$1.00 PER YEAR

ELECTRICAL VEHICLES CONTINUED.

Testing, Troubles in the Motor, and How to Find Disconnections.

No. 6.

BY SYDNEY F. WALKER, M. E.

The accumulator should always be tested as frequently as possible with a voltmeter, a hydrometer, and a thermometer is often useful. Each cell should be tested independently, by means of the voltmeter,

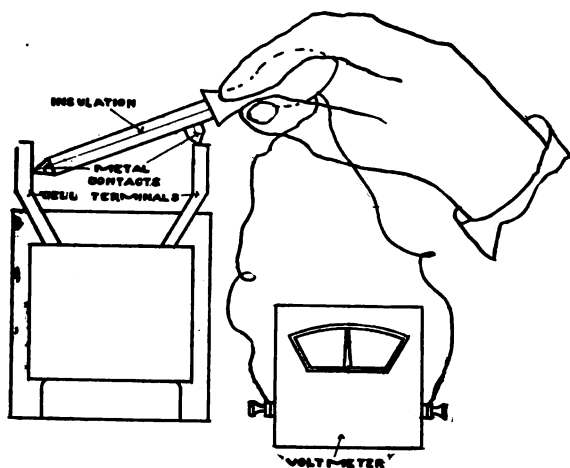


Fig. 13.—Diagram showing the testing of a single cell of an accumulator with a voltmeter.

as shown in Fig. 13, after the vehicle has been running some time; the lead accumulator cells may show anywhere from 1.8 volts each per cell, if everything is in order. If any particular cell shows less than 1.8, while the others show that figure, that cell should be carefully watched, and examined as fully as possible, and if it does not pick up, it should be replaced at the first opportunity by a good cell. If all the cells test below 1.8, it will be due to an excessive discharge, and the battery should not again be used until it has been fully charged, and received a light discharge, followed by a rest.

The object of this is, to see if the heavy discharge that has been taken from it, has permanently injured the battery. If only a slight injury has been done, nursing the battery, so to speak, will quickly get it up to strength again.

Nursing is done by charging it thoroughly, not overcharging, and discharging gently, then charging again, and so on. Where a single cell shows signs of being below the others, it may be brought up to full strength sometimes, by what is termed in England a "milking booster," where that is available. The "milking booster" is a small motor generator, arranged to furnish the current necessary to charge the battery, but with the pressure required for one cell, say something under 3 volts. The motor generator consists of a motor taking current from the source of supply, the charging current, at the charging pressure,

connected mechanically to a generator, arranged to furnish the voltage mentioned. The two sets of field magnets are mounted on one bed plate, and the two armatures are in one line.

A milking booster may be applied from the current of the battery itself, in special cases, though it would usually not be convenient, and it is better to take the current direct from the charging source. The milking booster is used to a certain extent in electricity generating stations, to fettle up individual cells of the station battery, and to avoid the necessity of dismantling and changing the cell. It takes its name from the fact that when the charge is complete, the electrolyte, the dilute sulphuric acid in the cell, assumes a milky color.

The hydrometer shows the strength of the electrolyte. The specific gravity of the solution of sulphuric acid and water, increases with the proportion of sulphuric acid present, and this is indicated by the position of the hydrometer. The hydrometer is simply a glass tube, having a graduated scale, and a long bulb below, which is weighted to cause it to sink in the liquid. When in the liquid, the hydrometer stands vertically, and the position to which the bulb sinks as marked by the scale, shows its specific gravity. When the cell is first made up, with fresh acid and water, the specific gravity is in the neighborhood of 1.2; water being 1. It is usually expressed as 1,200, water being 1,000. When the cell is charged, the

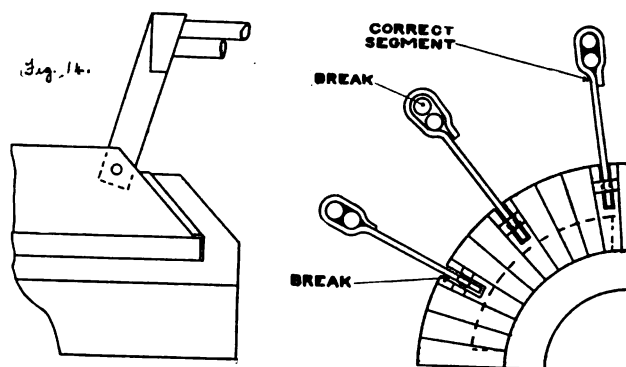


Fig. 14.—Showing the arrangement of coil ends and commutator segment lugs also how breaks in the circuit occur between the wires and the lug, and between a lug and its segment.

specific gravity rises to 1.275, and sometimes over; and again as the discharge continues, the specific gravity falls. It is a very simple test therefore, and one easily applied, to take the specific gravity of the individual cells, to see the condition of the electrolyte. In any case the specific gravity of the electrolyte should be tested periodically.

A point that is of great importance should be mentioned here. When electrical vehicles are brought to a repairing garage, to be overhauled, it may be necessary to add a little water, or a little sulphuric acid to the batteries. The water should be absolutely pure, distilled water; or if that is not obtainable, the water

of the greatest purity that is obtainable. Boiling the water and allowing it to cool, will free it from some of the salts that are held in solution; and some of the water softening plants that are employed in steam power generating stations, to deal with the water fed to the steam boilers, might with advantage be employed where much water is required for accumulator cells.

Further, the acid should also be very pure. Commercial sulphuric acid often contains considerable impurities, iron being one of the most common, as a

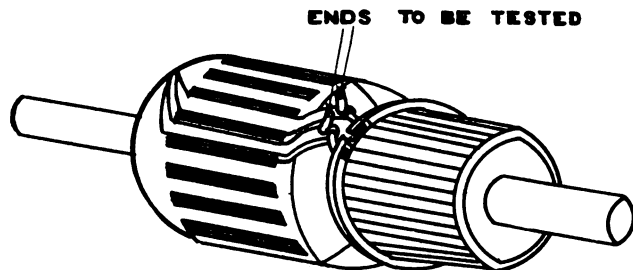


Fig. 15.—Showing a break made in the armature at one of commutator segments for the purpose of testing. A pair of ends are unsoldered from their commutator bar and drawn well clear of each other and of the commutator as shown.

good deal of the acid is made from iron pyrites. It will be remembered that in all commercial processes, especially chemical processes, the greater the purity of the substance obtained, the greater the cost; and this is particularly true as the smaller percentages of impurities are reached. It is comparatively inexpensive to abstract the bulk of the impurities; but in order to abstract the whole of them, the substance under treatment has to be subjected to the purifying process again and again; each time it goes through the process, or each process it goes through, extracting some small amount of impurity. Each process, however, costs money, and consequently the purer the chemicals, the more rapidly the price increases. If there is any iron in the acid, it may be deposited upon

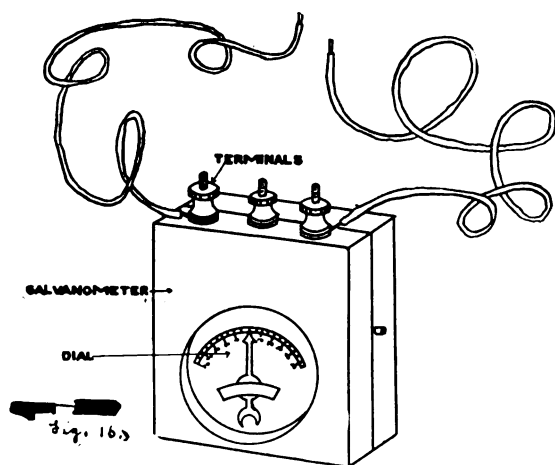


Fig. 16.—Lineman's galvanometer used for testing for faults, with test wires attached.

the lead plates, and set up what is called "local action," sometimes called "polarization." The meaning is, small galvanic batteries are formed by the iron, or the iron and salt, the lead and the liquid present, with the result that the lead is eaten away more or less, and at any rate useless galvanic action is going on, to the detriment of the proper production of current. The same reasoning applies to water. Ordinary tap water often contains small quantities of ammonia and

other substances, and very often large quantities of lime, all of which act upon the lead oxides, and upon the lead plates, and produce trouble.

Troubles in the Motor.

Of the troubles that occur in connection with continuous current motors, the revolving armature is responsible for a very large proportion. Faults in armatures are principally of two kinds, "Disconnections," and what are called "Shorts." By a disconnection in the armature is meant, a break in the continuity of the armature circuit. The whole of the armature coils should form one continuous wire unbroken, as though it had been wound from a single length of wire, into the various coils, and the two ends of the wire joined together, after the last coil had been wound. By "Shorts" are meant, connections between either two adjacent coils of the armature, or two adjacent portions of the same coil.

If a disconnection occurs in any part of an armature, the armature continues to revolve, but there is a good deal of sparking at the brushes, and the power

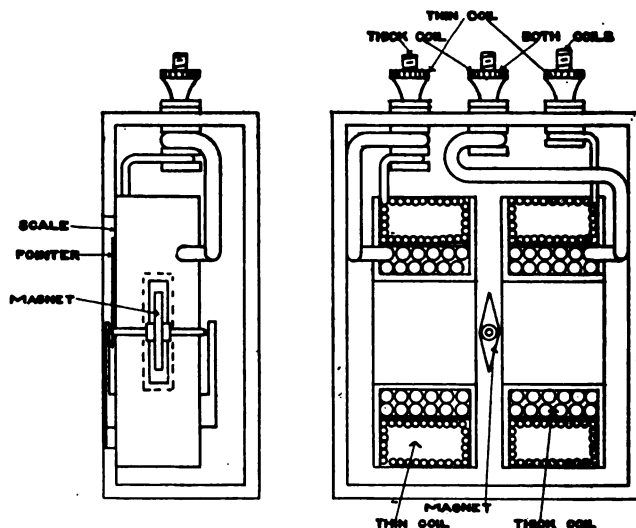


Fig. 17.—Showing the internal construction of a lineman's galvanometer.

obtained is usually less. If a "short" occurs at any part of the armature, the coil or coils in which they occur, will heat up very much, and further trouble will follow. The armature as a whole will be heated, the insulation of the coils in which the "short" or the "earth" exist will be destroyed, probably the insulation of the other coils will also be destroyed if an attempt is made to run the machine after the "shorts" occur.

Whenever a fault occurs, in any part of an electrical installation, or in any electrical apparatus, it is always wise to make a very careful examination of every part of the apparatus before proceeding to test, or to pull the apparatus about. Careful examination will very often give what Americans so expressively term a "pointer," that will lead directly to the cause of the trouble. A fruitful course of disconnection is, insufficient care in soldering the ends of the copper coils to the segments of the commutator. It will be remembered that the armature coils, though they form one continuous conductor, are wound in sections, each coil being wound by itself. When the coils are in place, and the commutator is also in place, adjacent ends of adjoining coils are soldered to the commutator bars, or to a lug that forms part of the bar. Soldering the two ends of the wires to the commuta-

tor bar, accomplishes a double object. It connects the coils to the commutator segments, and it connects the ends of the coils to each other. Considerable care is required in soldering the two wires, especially where the machine is a large one, to the commutator bar. A slot is usually machined in the bar, or in the lug attached to the bar for the purpose, and the ends of the coils are pushed carefully into the slot. The slot should be thoroughly tinned before the ends of the wires are pushed into it, and the ends of the wires

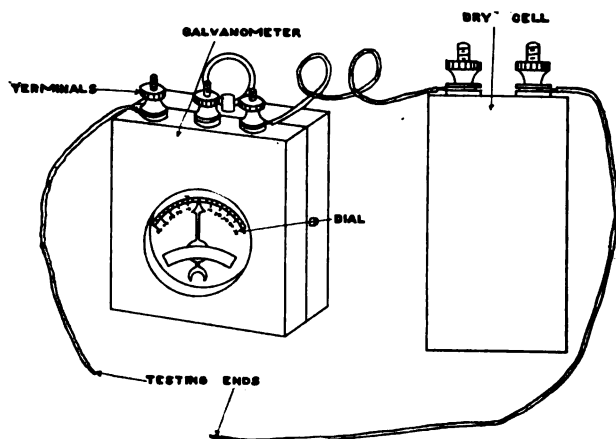


Fig. 18.—Showing the circuit of a dry cell and lineman's galvanometer used for testing purposes.

themselves should also be carefully tinned. It is convenient usually to tin the slots in the commutator bars before the commutator is built up. Carefully tinning both the commutator slots and the ends of the wires, ensures what is of so great importance in soldering masses of copper together, that the surfaces shall be quite clean. Copper will not take the solder unless it is thoroughly clean, chemically clean. A point may be mentioned here also that is of great importance, viz., the practice which sometimes exists of soldering with "spirits." This practice has long been discontinued in the best modern work. It is permissible, if the "spirits" have been very carefully "killed" before being used, and there is no resin at hand; but it is much better to solder with resin. There is always the danger of leaving a minute quantity of spirits behind, and many a disconnection has arisen from this cause. The disconnection when it arises at these points, the connections between the coils and the commutator, is often very difficult indeed to discover, especially in the poor light sometimes available. Fig. 14 shows a properly soldered joint, and one in which a disconnection exists. A disconnection may also occur between a commutator lug and its segment. This is also shown in Fig. 14.

A disconnection may also occur from a faulty joint in the wire with which the armature has been wound. In delivering wire in a long length, occasionally two pieces are jointed together by a scarfed and soldered joint. Such a joint ought not to be made. The coil ought to be taken off the machine, and sold as a smaller coil. When such a thing does happen, however, unless the joint is very carefully made, there is a possibility of a disconnection occurring there.

How to Find the Disconnection.

If a careful examination of the armature fails to reveal any disconnection, there are two methods of testing; either of which may be carried out without removing the armature from the machine, but both of which are more easily carried out by doing so. Further, as it will have to be removed to the bench to

solder up the faulty connection, it is as well to take it out of its place at once. The first method to be described depends upon forming a series of complete electric circuits, with an instrument in the circuit each time, until the instrument ceases to show the presence of a current, when the fault will have been discovered. It is necessary for this purpose, to make another break in the armature circuit, by unsoldering one of the pairs of wires from a commutator segment, pulling them out clear of the segment, and separating them from each other and from the segment, as shown in Fig. 15. The reason of this is, as there are two circuits in the armature, from opposite sides of the diameter, any test that would be made for disconnection, by forming the successive circuits described below, would be masked by the existence of the other circuit. Having made the disconnection, take any source of current, a single dry cell is the most convenient, and some instrument that will show the presence of a current. The lineman's galvanometer shown in Figs. 16 and 17 will be found a very useful instrument for tests of this kind. It is used by telegraph and telephone linemen for testing batteries, and for finding disconnections in their apparatus. Failing a lineman's galvanometer, a low reading ampere meter will answer the purpose; an ampere meter such as is used for motor car ignition batteries, reading fractions of an ampere up to about 5 amperes as a maximum, will answer very well. Make a circuit consisting of the dry cell, the ampere meter, or lineman's galvanometer, as shown in Fig. 18, and connect one of the free ends, say the wire leading from the dry cell, to one of the disconnected coil ends of the armature. Then make

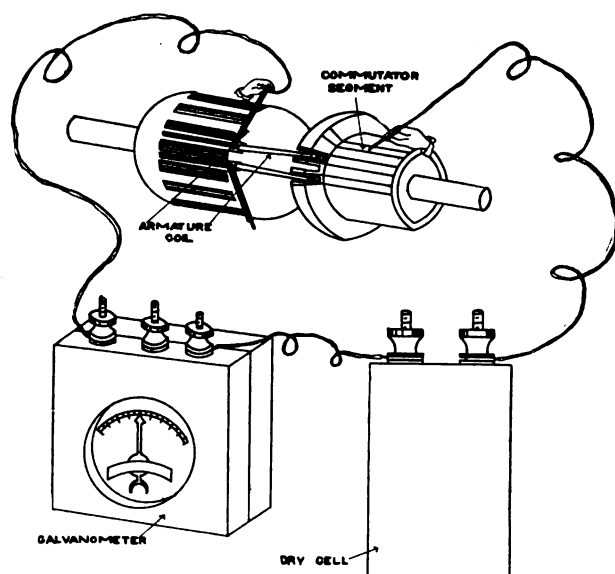


Fig. 19.—Showing how to test for a disconnection in an armature with a dry cell and lineman's galvanometer. One test wire is held on the end of one of the disconnected wires shown in Fig. 2 and the other touched on successive commutator segments.

a succession of circuits by touching the end of the other free wire, on to the commutator segments in succession, as shown in Fig. 19. In making this test, be very careful to have the ends of the testing wires quite clean, the disconnected ends of the armature coil wires also quite clean, and the surface of the commutator where the test wire is to make contact also quite clean. If the armature has been running and doing work up till the moment of stoppage, the commutator is probably quite clean; but there is always the danger that some oil or grease may have got on to the surfaces of the copper segments, while the ma-

chine has been pulled about. It will be wise to test first by making a complete circuit, excluding the armature altogether, by touching the free end of the testing wire, on to the end of the coil to which the other free wire is attached, and noting the deflection of the needle upon the ampere meter, or the lineman's galvanometer. As a rule, the deflection should be decreased very slightly indeed, by the interposition of the resistance of a number of the armature coils. Having a reading of a short circuit, will serve as a guide, as the test proceeds. Now touch the testing wire on each commutator segment in section, commencing with one adjoining that from which the ends of the coils have been disconnected, and proceeding outwards. As the test wire makes contact with each segment in succession, a deflection will be shown on the galvanometer, and the test can proceed rapidly. When the disconnection is passed, there will be no deflection upon the galvanometer. It will be as well, before deciding that the point of disconnection has

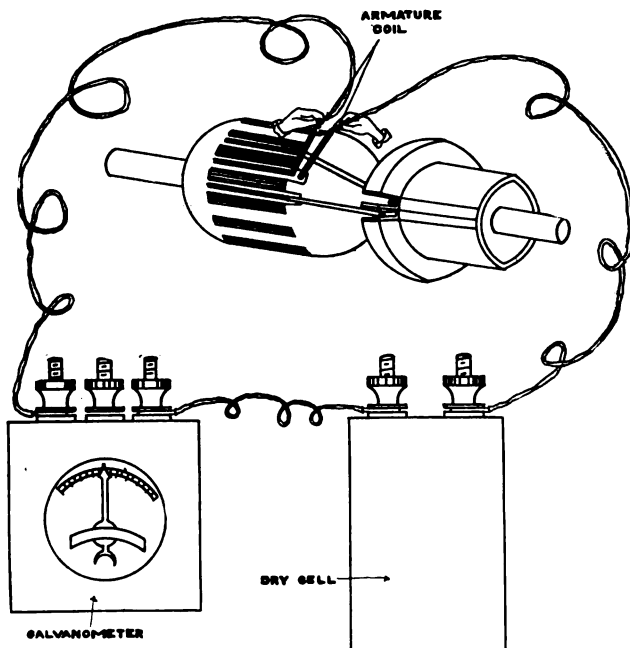


Fig. 20.—Diagram for testing for disconnection in a coil of an armature. The circuit is made up of the dry cell, lineman's galvanometer and the suspected coil.

been found, to make sure that there is no disconnection in the testing circuit, that all wires are properly clamped under their terminals, that there are no breaks in the testing wires, and that a clean surface of testing wire is pressed firmly upon a clean surface of commutator segment. Having made sure of this, the connection to the segment which has just been passed, must be carefully examined, and it will nearly always be found that the ends of the coils, or one of them, is not properly soldered to the other, and to the commutator segment, or the commutator segment to its arm. If a careful examination shows that this is not so, the coil itself must be examined for the other cause of disconnection, the possibility of a fault in the wire of the coil itself. If examination does not reveal anything of the kind, that coil must be disconnected from the commutator, by unsoldering its ends from the two adjacent commutator segments to which it is connected, and repeat the test for disconnection upon the coil itself, as shown in Fig. 20. One test wire is secured to one end of the coil, and the other test wire is touched firmly upon the other end of the coil. If there is a faulty place in the wire, causing a discon-

nection, no deflection will be shown upon the instrument, and the coil must be stripped. In some modern dynamos, the two ends of a coil may not be together, but 45 degrees apart. Fig. 21 shows the arrangement for testing in this case.

Having found the cause of the disconnection, as-

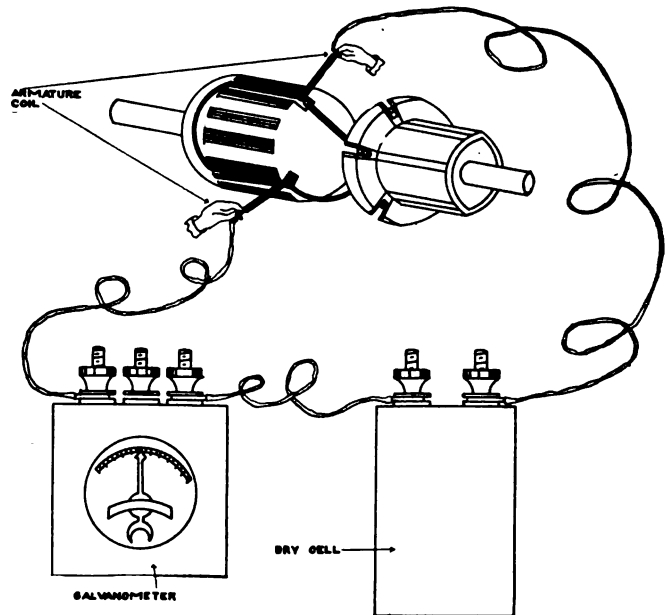


Fig. 21.—Diagram for testing for disconnection in a coil of an armature where the ends of the coil are 45 degrees apart.

suming it to be a badly soldered joint between the coils and the commutator, take out the coil ends of the faulty connection from the commutator slot, clean them very carefully and retin them, clean the commutator slot very carefully, and retin it, and again carefully remake the soldered joint, making sure that the solder finds its way to all parts of the two wires, and that a solid mass is formed between them and the slot in which they lie. For connections of this kind, it is not sufficient to have just a little bit of solder holding the wires together, and holding them to the commutator slot. The joint should form a solid compact mass, sufficiently strong to resist the centrifugal

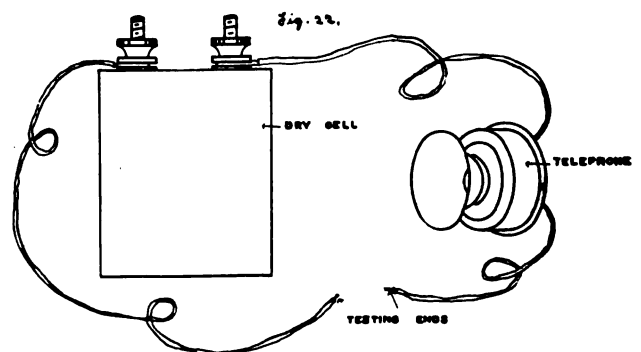


Fig. 22.—Diagram of an arrangement for testing for disconnection in an armature with a dry cell and a telephone.

force that acts upon it, as shown in Fig. 14, the expansion which takes place in the wires owing to the heat, and the vibration to which all armatures are subject.

Another Method.

In the other method a telephone is used, and it has the advantage that the test can be made without disconnecting another pair of coil ends, as is necessary in the test described above. It can also be made with

the armature in its place, but as again it will be necessary to take out the armature to resolder a bad connection, it will probably be best to make the test upon the bench. The parts of the commutator can be more easily got at. The telephone in this test takes the place of the lineman's galvanometer, or ampere meter. A circuit is formed of a dry cell, a telephone, and test wires, as shown in Fig. 22. Some firms in America have worked out special apparatus for pressing upon the commutator segments when the test is made, but it can be made quite easily with the ends of the wires. It is an open question whether time may not be saved by making a second disconnection in the armature, as described in the previous test. It all turns upon the ability of the ear to detect difference in sounds. When a second disconnection is made, the successive circuits are formed as before, and a click is heard in the telephone, as the test wire is pressed upon each segment of the commutator, until the disconnection is passed, when it can be exactly located by further examination as before. When a second disconnection is not made, one of the test wires is pressed firmly upon one segment of the commutator, and the other is pressed upon successive segments round the armature. The fault will be discovered,

CRACKED WATER JACKETS.

How to Repair Them and Some Incidental Welding Observations.

BY JAMES F. HOBART, M. E.

The immense force exerted by freezing water is not commonly realized by autoists until after a water jacket or two has been cracked by freezing up. The junk dealer understood this force better when he took the contract of breaking up some large castings which had defied the efforts of the heaviest "skull-cracker" in the foundry yard. Pieces of scrap iron which are too large to go through the cupola door are of little use to the foundry, so this junk dealing genius, finding upon examination that the castings were hollow, drilled small holes into each cavity, carefully filled them with water, tapped screw-plugs carefully into each drilled hole and then—prayed for cold nights. After a while, he got them—several, in fact, and those castings were split, from hole to hole, where the expanding water had torn the metal asunder.

Water jackets crack very readily indeed, and when a jacket is so constructed—as it usually is—that the inlet and outlet water pipes freeze first, then the

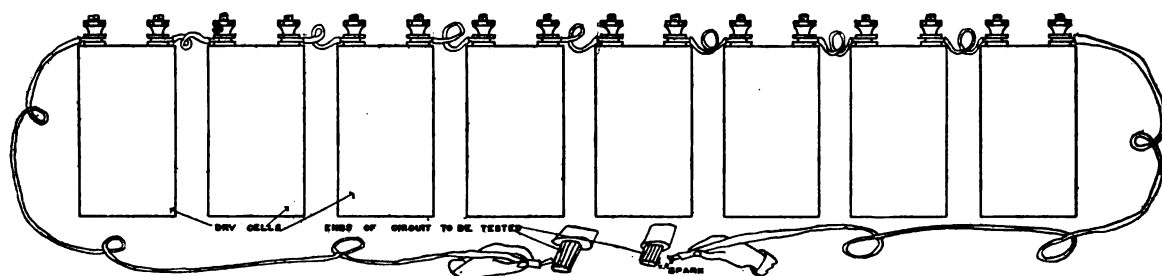


Fig. 23.—Several dry cells in series for testing with the spark.

by the difference in the sound when the segment is passed over, in which the fault occurs. This last test may be further elaborated by testing each coil in succession, with the telephone and dry cell in circuit, by pressing the test wires upon two adjacent segments. The faulty coil will be found by the difference in the sound again. It must be borne in mind that there is always a circuit around through the remainder of the coils, and therefore there will be a click in the telephone, when the faulty coil is in the test circuit, but it will not be as loud as when other coils are in.

There is yet another method of testing, that may be applied, when neither a telephone, nor a galvanometer, nor an ampere meter is available. The faulty coil may be found by the absence of a spark passing between the test wire and the commutator segment, when the fault is passed. A second disconnection must be made as before, and it would be wise to have several dry cells in the circuit for testing, as shown in Fig. 23. The wire from one end of the battery is connected to one of the coils that have been purposely disconnected, and the other is touched successively on the commutator segments, and removed quickly. For the test, the armature should be in a dark place, so that the spark can easily be seen. It will be found that the spark increases as coil after coil is brought into the test, and ceases when the break is passed. The exact location of the break can be found as before.

It is much handier to use the foot brake than the emergency, but for the good of the car and the equalization of brake wear, both sets should be employed.

water in the jacket is effectually trapped, just as it was in the plugged castings, and the terrific force of the freezing water tears up the jackets as though they were toy balloons.

The preventions of freezing is one thing—that will not be discussed here—neither will I try to tell about a method of designing jackets so that in case of freezing, a graduated area of water space is provided so that the final freezing, which does the cracking, is in a direction which is relieved by means of a safety plug, which in turn is forced from its seat by the expanding ice before the strength of the water jacket is exceeded. This method of crack prevention is quite practical, and the jacket designer may work it out easily. This article is to deal with the repair of jackets after they have been actually cracked and made worthless by freezing.

We have an oxy-acetylene welding outfit in our shop, and cracked metal parts of all kinds are brought there for repair. The handling of some of them certainly calls for all the resources of our best mechanics. Recently, three water jackets came in, all of them badly cracked, the fractures extending for several inches in a general circular direction. Each of these jackets had been patched. And that patching certainly appeared to be a work of art. Three of the nicest fitting patches I ever saw covered the top portions of each cylinder—one patch on each—and the patches were held by 3-16 inch machine screws tapped into the walls of the water jacket, through the patch, and these screws were so spaced that there was just about $\frac{1}{4}$ inch clear space between the screw-heads. It cer-

tainly was the prettiest job of patching I ever saw, and the owner of the engine said the work had cost him \$20 and still the jackets leaked.

The cylinders were first cleaned of all grease by dipping them for a few minutes into a vat of boiling potash-water, which effectually "cut" the grease, leaving its contained dirt in condition to be readily washed or brushed off. Next, one of the cylinders was heated in a sort of forge fire which is a part of the welding outfit—just an ordinary flat brick bench with a place for fire in the middle thereof, and supplied with blast from a power-driven fan.

One of the cylinders was placed on the fire—charcoal fire is best—to be "preheated" as the oxy-acetylene welder calls it. That is, the portions to be welded are heated to a red heat, and such other portions of the article are also heated as will cause the resulting contraction of the weld to take place without breaking the welded object apart again. Thus, in welding the arm of a very small cast iron pulley, as at A, in the illustration, it is necessary to heat the rim of the pulley, and to heat it about as hot as it will stand, in order to permit the weld which is to be made at A, to cool without being torn apart again by contraction of the weld. Contraction is what probably broke the casting in the first place; the rim cooled before the arms and hub, then when they contracted during cooling, the arm was torn apart at A, because that point chanced to be the weakest one.

By heating the rim of the pulley at C and B, the entire segment of the pulley is expanded, the gap in arm A, is opened, and the hotter the pulley rim, and the more of it is heated, the greater will be the opening at A. It is always the aim of the welder to so heat the portions in any object, which correspond to B and C, that when they cool, the contraction in point A, will be exactly equal to the amount of contraction in the narrow weld which is to be made at that point. And when the welder judges right, then the pulley arm A, will stay welded. But if he guesses wrong, and does not allow enough contraction at B and C, then A will tear apart again after welding. On the contrary, if the welder pre-heats too much at B and C, and puts more expansion into A, than the resulting contraction can take care of, then it may be possible that the rim will be cracked at either B, C, or between the two points mentioned. This is not very likely, however, therefore it is better to pre-heat too much than too little.

But heating the rim at B and C, is not really the actual pre-heating as that term should be understood. The real pre-heating is the heating of the point A, and the adjacent heavy portion of the hub, in order that the amount of heating required from the welding flame may be lessened as much as possible. Actually, the pre-heating of point A, works right against the taking care of contraction in arm A, and the rim at B and C, must be heated enough more to take care of the pre-heating of parts at A. Hence, it is desirable in a case of this kind, to pre-heat as little as possible and let the welding flame do all the heating possible.

In the water jacket, the conditions were different. There were no confined portions to be torn asunder as in the case of the pulley arm, hence the entire top portion of the water jacket could be brought to a low red heat, thereby reducing greatly the cost of heating with the oxy-acetylene flame. But when the water jacket under discussion—or one of them—was placed in the fire for pre-heating, things began to happen rapidly.

First, there was a cloud of thick smoke rising from the heated portion of the water jacket and the welder snatched it from the fire to see what was the trouble. The top of the water jacket was thickly studded with partially screwed in machine screws, but the beautiful patch had entirely disappeared, except a very small portion of one corner, which remained in place. Alas! the beautiful patch was only sheet lead! No wonder that it had been fitted so nicely to the jacket and presented such a neat appearance! Almost any workman could make a fine looking job with a lead patch—and no wonder that the patch still leaked! The tensile strength of lead is very low—only about 3,000 pounds to the square inch against 60,000 pounds per square inch for steel, therefore it is easily seen that a patch $\frac{1}{8}$ inch thick can possess very little resisting strength against the great pressure exerted in the walls of the water jacket when it became heated, or cooled and changed its shape under the influence of expansion or contraction.

Welding is done by means of a small flame, as big as a lead pencil, which is obtained by the burning of a mixture of acetylene gas and oxygen, both gases being brought to the burner under about 20 pounds pressure per square inch, and mixed in the burner about one inch from where they come out and ignite. The little flame, although it looks very insignificant, is about the hottest thing known. The flame has a temperature of more than 5,700 degrees by the ordinary thermometer, and when the little flame is made to blow upon a metal surface, it just melts a hole right into the metal—melts it in before the surrounding metal has time to get hot.

With a piece of the same metal as the work in one hand, the flame in the other, the welder heats a portion of the cracked water jacket until the metal is pasty and almost melted. Then, he melts off a bit of the metal held as a soldering stick, and directs the pencil of flame in such a manner that both the work and the new material—which acts much like solder in joining metals by the soldering method—are brought to the melting point and the new material flows upon and joins itself with the work pieces which are softened and melted only over a very small space which is to be covered with the new material.

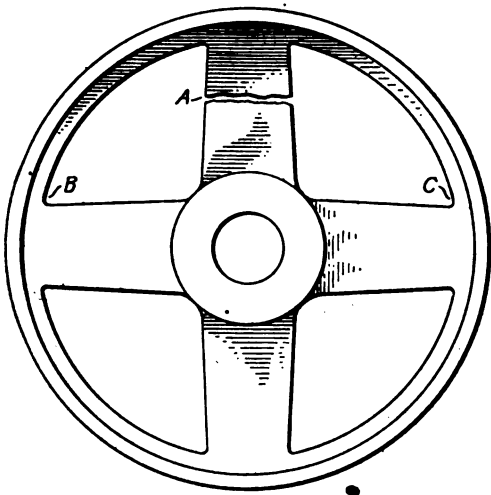
Having made the little bunch of new material flow exactly where it is wanted, another section of the work is heated, another bit of the soldering stick melted and coaxed into position, and so along the entire seam or crack. It is not necessary that the corners of the joint be beveled in this kind of welding, for the flame may be used to melt the metal right down to the bottom of the thickness it is desired the weld to reach. Once the metal is melted to the required depth, the melted portion flows into the bottom of the cavity formed by action of the flame, and it is only necessary to add more metal from the soldering stick to bring the level of the finished work to the desired height. In this manner, the weld may be "built-up" as desired.

For a "welding stick" the same kind of material may be used which is to be welded, although it is preferable that in welding steel, a softer variety be used. In welding cast iron, a very soft cast iron should be used because the metal which is melted off the soldering stick and off the work, is very apt to become much harder during the welding operation. In fact, metal thus melted, may be made so very hard that no file can touch it and any required finishing must be done with an emery wheel.

On the other hand, by properly proportioning the

oxygen and acetylene gases in the burner, the weld may be made almost as soft—but not quite—as the metals which were welded. When a large amount of acetylene gas is used and a small amount of oxygen, then the weld is carbonized and becomes very hard; that is, the metal receives carbon from the gas-flame and becomes transformed into steel. If the work is heated red hot and annealed, after being welded, it will be some softer than before annealing, but the best way is to use as much oxygen and as little acetylene as possible in the welding flame. This prevents carbonization and the work comes out nearly as soft as before welding. But too much oxygen should not be used, or the welding will be too weak, the joint soft and spongy. Indeed, the oxygen gas alone may be used for cutting off iron, steel or any other metal—"in a pea-green hurry!"

All that is necessary to cut holes in metal, is to heat red hot the beginning of the portion to be cut—that is: heat red hot a little bit where the cut is to commence, then shut off the acetylene and blow a thin



Welding a Cast Iron Pulley.

stream of oxygen gas right upon the heated portion, where the cut is to start. Where oxygen hits the heated metal, the union is so fierce that the metal burns right up, and is driven off in gas, slag, and lots of sparks, leaving a clean cut through the metal, as smooth as if a saw had done the cutting. With a sliding, screw-operated guide for the oxygen tip, a straight narrow cut may be made through metal four or five inches thick and the metal on either side of the cut will scarcely be heated, so quickly is the metal burned away when the stream of oxygen flame strikes it, provided the starting point is heated red hot, to begin with.

When too much oxygen is used in welding—and this is known by the great number of sparks which fly off—then there is danger of burning the weld, and the remedy is to use more acetylene and less oxygen. When exactly the right amount of each gas is used, the flame will be "neutral." That is, it will neither oxidize or carbonize. This kind of flame is desirable for welding, but it is a pretty hard matter to tell when the flame is just right—that is, while using the flame. After the job is done, it don't take two minutes to tell whether it is hard or soft—in fact, a single rub with a file, tells that story. But it is too late to remedy matters, or change them, so keep both eyes "wide open" when doing autogenous welding, and the trick

of getting the flame pretty near right will soon be learned.

It is not at all an expensive proposition for the repair man to install an oxy-acetylene welding outfit. The acetylene can now be brought safely, compressed in tanks, or a little generating plant is not expensive. The oxygen is a commercial product, being sold in tanks in which the gas is highly compressed, and shipped easily and cheaply all over the country. A cylinder of each gas, a couple of reducing valves, one attached to each cylinder two rubber tubes and the blow-pipe welding tip—that is all the necessary equipment for hot-flame welding, the ordinary smith's forge being utilized for pre-heating.

It is some cheaper to install an oxygen generating outfit, together with an acetylene generator. The oxygen generator is quite simple. It is a small closed cylinder in which black oxide of manganese and chlorate of potassium, in the proportion of 8 parts potash to 1 part manganese, are roasted, after being thoroughly mixed. The gas comes off in a few minutes, passes through a filter, called a "scrubber" where impurities are held up, then the gas passes into a storage tank, where it is held under 100 to 150 pounds pressure to the square inch, until needed for welding.

In welding that cracked part the flame is played upon the crack until the metal softens and is about to run, then a bit is melted off the soft cast iron "soldering stick" as described elsewhere, and caused to unite with the metal and fill the crack level full or a little more than level full, if it is intended to finish the surface by grinding after the welding is completed. But usually, the surface is left as it comes from the welding—full of little waves where the separate welding operations left little flow-marks, like ripples on the muddy bank of a creek.

Unless the water jacket is pretty well pre-heated, there may be trouble in finding a place where the welding can be stopped. For, by the time the weld arrives about at the end of the crack, the welder may see a fine white line in the jacket, extending a little way ahead of the weld. This fine line is an extension of the crack, caused by expansion of the welded parts. There is nothing to do, but to follow this crack, welding it up, until you have reached the end of it. And sometimes again, the crack keeps running ahead until it goes clear around the jacket and runs back into the place where the weld was begun.

Therefore, when estimating upon welding a cracked jacket or other part, do not cut the amount of welding down too much, for that crack may have to be chased several inches more than is apparent when the job is begun. Oxy-acetylene welding is worth from \$2.50 to \$3.00 per hour, actual time on the work, and it takes time to run several inches more than expected, therefore you can only come out even by estimating considerable more soldering necessary than actually shows when the parts are examined.

Can aluminum be welded? Sure. Almost any metal, or metals, can be welded by the hot-flame process, but welding aluminum is a mighty ticklish piece of business, and you must let it severely alone until after you have mastered thoroughly, the welding of steel, iron and cast iron. Then, try aluminum.

In farming sections everywhere the automobile is coming into wide use. There is no limit in sight to the development of this great industry and invaluable utility.

BORE AND STROKE.

The Most Efficient Proportions Do Not Run to Either Extreme.

They are still harping on the long and short stroke engine, especially on the other side of the water. Bearing in mind the fact that engines over there are usually measured by the metric system, one interesting discussion was based upon engines from 98 mm. bore and stroke respectively, to 80 mm. bore and 150 mm. stroke. One well known and successful designer and engineer concludes that a 90 x 120 mm. engine is equal to an 80 x 150 mm. at high speeds, and better at low and medium speeds, or the speeds at which most ordinary road work is accomplished. He suggests that the relative merits of the engines under discussion be classified under the following heads:

- (1) Maximum horse-power attainable.
- (2) Torque or pull at low speeds, particularly at car speeds of 10 to 20 m.h.p.
- (3) Mechanical reliability and durability.
- (4) Weight.
- (5) Freedom from vibration.
- (6) Compactness of design.

Three engines having bores of 98 mm., 90 mm. and 80 mm., and strokes of 98 mm., 118 mm., and 150 mm., were taken and examined under the given headings.

Maximum Horsepower Attainable.

The horse-power to be obtained from any engine is a function of three things: (a) The cylinder capacity, (b) the mean effective pressure or the average pressure exerted upon the piston by the explosive mixture, and (c) the engine speed in revolutions per minute. The technical reader will recognize the above statement as axiomatic, the non-technical may accept it and pass on. The cylinder capacity of an engine is, as has been defined, something which can be accepted as a fact and a known quantity about which there can be no argument.

If we postulate the same engine speed for all three engines, which may be what we please, say a maximum of 2,000 r.p.m. for touring car engines, we are then left with only one debatable point, i.e., the mean effective pressures. The relative maximum horse-powers are proportioned to the mean effective pressures.

We have now to consider if there is any reason why the m.e.p. should vary in the examples taken. Wise men state that the m.e.p. attainable in an engine of 98 mm. bore is considerably greater than that attainable in an engine of 80 mm. bore, since in the smaller bore engine the explosive mixture is subject to a greater cooling influence due to the proximity of the walls of the combustion chamber. The opinion of the engineer quoted, speaking as a mere practical designer, is that there is a greater difference between the m.e.p.'s of engines of the same bore than between those of the best examples of engines of varying bore. He has found that at a maximum estimate there is not a three per cent. variation between the m.e.p. of an 80 mm. engine and that of a 98 mm. engine at the same engine speed, given that the engines are well designed and that the m.e.p. is not limited by extraneous considerations such as bad carburetors, faulty ignition, and the like.

This is the state of mind engendered by testing some hundreds of petrol engines on the bench, and not that from testing an obsolete cycle engine on a laboratory test bench.

We arrive then at the conclusion that the maximum horse-power, or what is practically the same thing for touring car engines, the horse-power at 2,000 r.p.m., is

independent of the particular bore and stroke for all engines of the same cylinder capacity.

Horsepower at Slow Speeds.

It is well known that some engines pull better at slow speeds than others. In many cases this may be due to lightness of chassis or the possession of low top speed; but for the purpose of comparison, we must isolate the engine from the car and consider whether the horse-power in the engines taken as examples although practically the same at 2,000 r.p.m. is likely to vary at engine speeds of 400 r.p.m. up to, say, 1,000 r.p.m., i.e., from car speeds of 10 m.p.h. to 25 m.p.h.

It is this particular portion of the speed range which is so much in evidence when picking up in traffic or round corners.

Here it may be distinctly stated that the engine with the large bore definitely scores. Experiments indicate that between two engines of the same cylinder capacity, giving the same maximum horse-power, the horse-power at the lower speeds is some 10 per cent. better with the large bore engine—a very appreciable amount indeed, which can best be appreciated when it is mentioned that it is equivalent to two heavy passengers on a car with total laden weight of 3000 pounds.

The reason for this is doubtless due to the extra reduction in m.e.p. due to the cooling of the explosive mixture in the 80 mm. bore cylinder, since at low speeds this cooling theory seems quite reasonable owing to the longer period of contact between the gases and the cylinder walls.

This consideration would suggest that the 98 x 98 engine was the best of the three; and there is indeed a strong case for such design, but unfortunately the engine would need to be considerably longer than with the smaller bore, in order to obtain sufficient bearing surface to the crankshaft, and the valve springs would need to be considerably shorter unless the connecting rods were made unduly long. The long engine effectively shortens the body space where inches are precious, while the short valve springs tend to unreliability. And, lastly, but far from least, the public look with suspicion upon a short stroke engine, having apparently the vague idea that in a small bore engine with a long stroke it is getting something for nothing.

The 90 x 118 engine is a happy mean between two extremes, and possesses a larger share of the advantages of the 98 bore engine than of the disadvantages of the 80 bore.

Mechanical Reliability and Durability.

So far as freedom from breakdowns is concerned the ratio of stroke to bore is insignificant compared to the effects of possible variations in detail design.

It is of interest, however, to examine the effect of the various bores and strokes on the design in general; and, since this subject is inexhaustible, the examples chosen will be the 90 x 118 and 80 x 150 types.

It is obvious that the 80 x 150 engines must be more gawky in design. The crank webs are longer, the crank case correspondingly wider and deeper, the connecting rods longer if the same sweetness of running be desired, and the flywheel heavier. This question of weight will be dealt with separately.

To secure sweetness of running, it is absolutely essential that the crankshaft and connecting rods be as stiff as possible, and this condition is much easier to secure in a design of moderate proportions than in one where the stroke is nearly twice the bore. This is obvious in the case of the crankshaft, since the shorter the stroke the

more nearly the crankshaft approaches a straight shaft, which is the ideal condition for stiffness.

Other things being equal, it is certain that the most durable engine is that with the stiffest crank. Those who have followed recent developments in engine design will agree that the increase in crankshaft diameters is one of the outstanding detail improvements in recent years.

Weight.

The advantages of the moderate or short stroke engine, from the point of view of weight, have been hinted at, and will now be considered at greater length. The writer's experience leads him to consider that, if two engines of the same capacity are to be designed with the object in view of equal durability and sweetness of running, an engine with a bore and stroke of 80 x 150 will be at least 15 per cent. heavier than an engine with a bore and stroke of 90 x 118.

Taking the main items separately, we have:

Cylinders.—The 80 x 150 will be longer in the bore than the 90 x 118. Since the same size valves are required for equal power output, the overall length will be the same. The water jacket will be of greater area, owing to the length of the stroke, the width of the cylinder casting only being less, and that only by a small amount.

Crank Case.—The crank case on the 80 x 150 is wider and deeper owing to the longer stroke, so much so that in some cases the valves have to be inclined to obtain anything like a reasonable combustion chamber.

Crankshaft.—This should also be of larger diameter and with stiffer webs to avoid springing in the case of the 80 x 150, and when crankshafts are increased in diameter the weight goes up with a run.

Connecting Rods.—If there are the same length in both 90 x 118 and 80 x 150, then excessive vibration is necessarily entailed with 80 x 150 as well as greater angularity and cylinder wear. If the length of 80 x 150 rods have the same ratio to the stroke as in the 90 x 118 types the height and weight of the engine are increased, and thermo-syphon cooling is rendered more difficult unless the radiator be made unduly high to obtain sufficient head.

Pistons.—These, of course, can be lighter in the 80 x 150 design, the possible saving being about 30 per cent. or, in actual figures, about 2½ lbs. on the four pistons.

The writer has weighed the two engines of the same cylinder capacity referred to previously, and in this case the 80 bore engine is twenty-five per cent. heavier than the 90 bore engine, although in the 80 bore engine the weights were cut and stresses increased more than in the other design.

Consider what even a fifteen per cent. increase of engine weight means. It is at least three-quarters of a hundredweight, which could profitably be expended in a self-starter, dynamo or other accessory.

Vibration.

There are two fundamental causes of vibration in motor cars, i.e., two which it is impossible to eliminate on the orthodox design of a four-cylinder engine.

First is that due to the torque reaction which is virtually the same for all types. Secondly that due to what are known as secondary unbalanced forces. In this latter respect the 90 x 118 scores, unless the connecting rods of the 80 x 150 are made so long that other evils such as whip or undue weight ensue.

The magnitude of these forces is apt to be underestimated, but at fairly high engine speeds they can easily amount to a vertical force 300 or 400 lbs. applied some 40 or 50 times per second. Their reduction is evidently of first importance.

Compactness of Design.

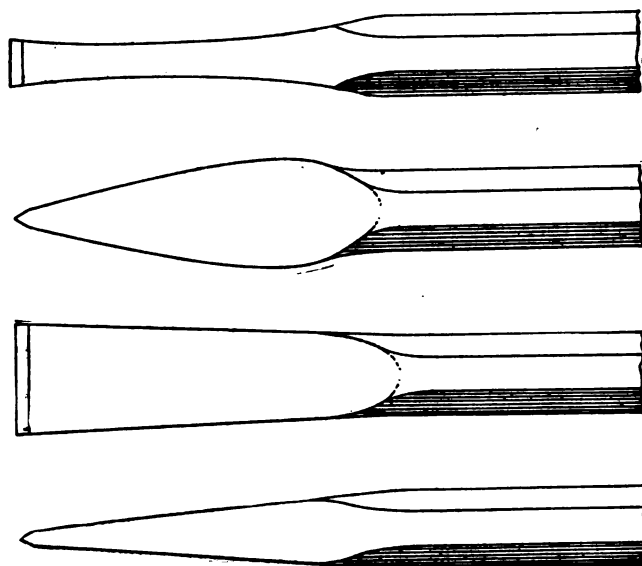
From what has been written it follows that distorted ratios of bore to stroke do not tend to compact design, and in these days when bulky accessories have to be welded into the engine design any tendency to gawkiness is to be deprecated.

Summing up, the writer is convinced, for the reasons given, that a ratio of stroke to bore of 1.33:1, giving for a three-litre engine a bore and stroke of 90 x 118, produces an engine which, from the point of view of acceleration, durability, smoothness of running, absence of vibration, lightness and general neatness of design, is superior to a stroke-bore ratio of 1.89:1, or a bore and stroke 80 x 150.

SMALL TOOLS.

They May Be Made at Odd Times by the Mechanic at a Small Cost.

As a rule such tools as chisels, punches, and drills may be purchased at less expense and trouble than they can be made, and yet it is worth while to know how to make them, for often one of a peculiar kind is



Figs. 1, 2, 3, and 4.

badly needed and there may be no way of getting it without making it. Tools that are bought may always be excellent, but tools that are made at home seem always better, and the skill acquired in making them is of service in many other ways.

Small chisels and punches are made of octagonal tool steel, which is sold by the pound. Small drills are usually of silver steel rod, solid in various lengths and sizes. The heat necessary for forging may be obtained on a brazing hearth, or in the domestic fire, as tool steel is forged at a low red heat. A heat approaching white would burn the steel. If a real anvil be not at hand any sufficiently solid lump of metal will serve.

Perhaps the easiest tool to begin with is a flat chisel, Figs. 1 and 2, of 5-16 inch octagonal tool steel. The method in detail is as follows: Heat the bar to a low red and draw down to shape on the anvil, remembering to discontinue the forging and reheat the work when it reaches a blue heat, or it will forge hollow and be liable to crack. In any case, the end will probably split a little, so allowance must be made for this, and the flat drawn down longer than is required in the finished chisel.

There is a little knack in "drawing-down" that de-

serves a few words of explanation. The blow of the hammer must not be delivered in a direction vertical to the anvil-face, but somewhat towards the operator, and the end of the bar held in the hand must be higher than that which is resting on the anvil. How much towards the operator the blow should be delivered, and how much higher the end held should be than the other, depends upon the angle of taper it is de-

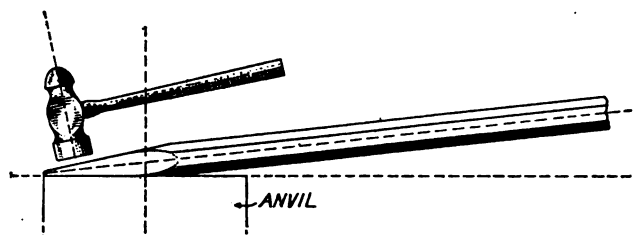


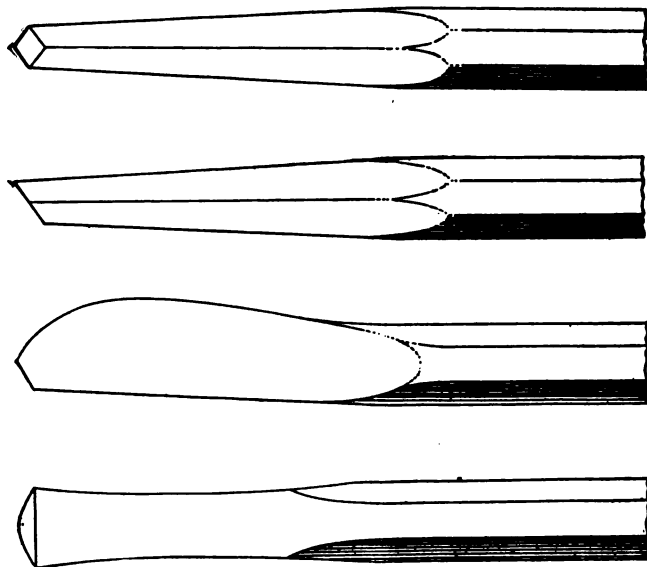
Fig. 5.

sired to produce. An illustration (Fig. 5) will make this clear. The practical tip when learning to "draw down" is that when the blow is struck the wrist must be higher than the hammer head.

The work should be turned over frequently in order that it may be hammered equally on each side, and the sides of the flat should be kept square by occasional light blows, the bar in this case, of course, being horizontal, and the hammer-blow vertical. The hammering during forgings serves not only to shape the metal but to pack it. A good smith would probably forge so small a chisel in one heat, but the beginner may find it necessary to reheat the work several times.

The forging being completed, the end where it is split may be trimmed off on the anvil chisel, and the chisel itself may be cut off the bar.

A cape or cross-cut chisel (Figs. 3 and 4) after a little drawing down is forged on the beak of the anvil,



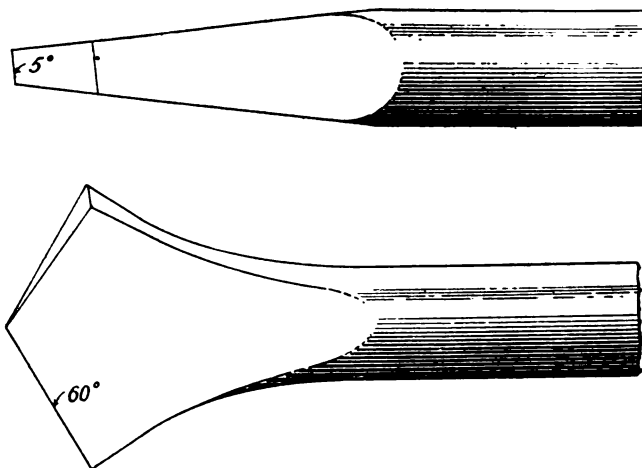
Figs. 6, 7, 8, and 9.

and the inward curve of the sides thus formed gives clearance for the edge of the tool in deep grooves. A chisel for cutting oil grooves (Figs. 6 and 7) is forged in a similar manner. A diamond point chisel (Figs. 8 and 9) is drawn down square, while a punch is drawn round, the bar being rotated a little between each blow. The taper in these should be about the same as the flat of a flat chisel, that is, five degrees or a little more.

To forge a flat drill (Figs. 10 and 11) a rod of silver steel is taken of half the diameter of the hole the finished drill is intended to make. It is heated to a cherry red, and the end flattened and spread out to a fan shape, the blows being delivered evenly and equally on either side in order to keep the blade true and its fan shape symmetrical. The edges of the fan are not hammered.

Tools after forging are ground or filed to their finished shape, hardening and tempering being the final processes. Either an emery wheel or a grindstone can be used for grinding, and it is desirable that the wheel should revolve away from the operator, especially in grinding drills.

In grinding flat chisels the hammer marks are ground out of the flats, and the sides ground square and reduced a little at the back, leaving the flat widest at the cutting edge, which may be ground for general purposes at an angle of sixty degrees. A cape or cross-cut chisel is ground on the sides and flats, care



Figs. 10 and 11.

being taken to get them symmetrical, especially the curve of the sides; this will be found to present some difficulty until one has had practice in grinding. The edge of the cross-cut chisel may be ground at 60 degrees. The sides of a grooving chisel may also be given clearance, and the face ground at an angle to the top flat, the back being rounded rather sharply to meet the curve of the back (see Fig. 7). A diamond point chisel is ground on the four flats, and the end ground diagonally about 45 degrees. Punches may be filed in the vise, but preferably in the lathe, which is indeed necessary in the case of a centre punch, whose point should be filed to 60 degrees. All these tools used with a hammer should have the heads chamfered.

The grinding of drills requires a little practice. The flats should be ground bright and the fan edges, which are rounded after forging, may be ground flat a little way up. The lips must be of equal length and at an equal angle (60 degrees) with the axis of the shank. The cutting edges should have a clearance of 3 to 5 degrees (Figs. 10 and 11). The drill should be presented to the wheel as in Figs. 12 and 13, which gives a right hand cutting drill.

Lastly come hardening and tempering. If tool steel be heated to redness and suddenly cooled by quenching in cold water it becomes extremely hard, the degree of hardness depending upon the quality of the steel and the temperature to which it was heated. When hardened it cannot be filed or worked in any

way except by grinding, and it is too brittle for the metal-working tools with which we are now dealing. It is accordingly subjected to a further process known as "tempering," which renders it less brittle, and although less hard, still hard enough to retain its cutting edges in use. Tempering consists of slowly heating the steel, after hardening, to a temperature between 430 degrees Fahr. and 610 degrees Fahr., according to the hardness required in the finished tool—the higher the temperature reached the softer will be the cutting edge of the tool.

The method in tempering a small tool such as a

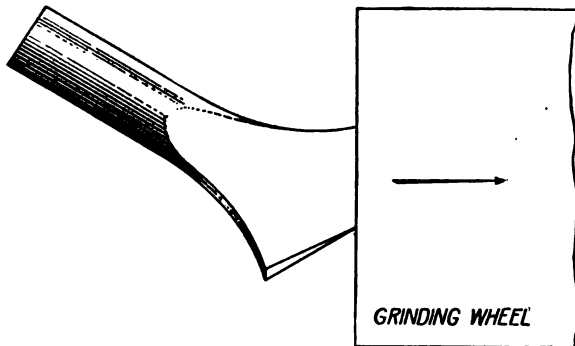


Fig. 12.

chisel, punch, or drill, after hardening it, is to polish it bright with emery cloth at the part where it is to be tempered—the blade of a chisel, the taper of a punch—and then to heat the shank slowly. Soon a light yellow tinge will be seen to creep from the shank up the polished part. This will deepen to straw yellow, brown yellow, light purple, dark purple, clear blue, pale blue, as the temperature rises. These "temper-colors," as they are termed, are due to oxidation, and as each of them corresponds with sufficient

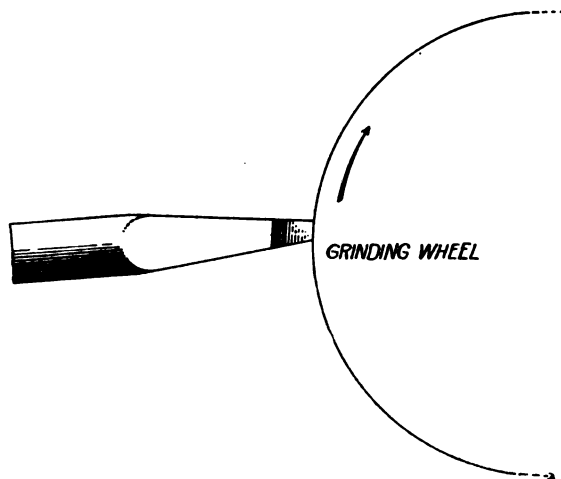


Fig. 13.

accuracy to a definite temperature, one disregards the actual temperatures attained in working, and is guided solely by the temper-colors. When the blade or end of the tool shows the desired color the tool is quenched, as otherwise the heat in the shank, passing by conduction up the tool, would lower the temper of the blade more than required. It is desirable to heat tools slowly when tempering them; firstly, because the colors then run up slowly and the tempering can readily be stopped at any desired point; secondly, because the temper will more likely be gradual all the way up. A punch, for example, will have a blue on the taper near the shank, fading evenly through the

purples and brown yellow to straw color at the point. A well-tempered tool should have the temper colors fading imperceptibly one into the next; at any point where a sharp difference of temper occurs a breakage is likely to result.

The temper-color for punches is a straw yellow, and for drills, lathe tools, and chipping chisels a little deeper yellow. Chisels for rough work may be "let down" as it is termed, to a light purple: springs are let down to a blue and quenched in oil.

It must not be forgotten that the temper-colors are merely indications of the temperature to which the steel has been raised when tempering it; the actual hardness of the tool after tempering depends upon its hardness after hardening, as well as upon the temperature when tempering.

All that now remains is to clean and polish the tool. The sides of the octagonal part of chisels, etc., may be left rough, and oiled, but the bright part should be polished with smooth emery cloth to get as good a finish as possible: for well-finished tools are a credit to the maker and pleasant to handle. In making a little set of chisels for some particular friend, I have sometimes gone to the trouble of polishing all the octagonal part, by filing and emery cloth. It takes some time and energy, but the results seemed to me to be worth the labor.

POINTS ON CARBURETORS.

Some Problems in Relation to the Development and Operation of Internal Combustion Engines.

(E. H. Stickels before the National Gas Engine Association.)

The advancement in the art of propulsion has presented some difficult problems for solution, and the one that is most discussed by those who have to do with the development and use of liquid fuel engines is that of carburetion. This function is not confined entirely to the device called a carburetor. This is undoubtedly the most indefinite feature of any part of the internal combustion engine. It would be impossible at this time to discuss the different principles and types of carburetors, and it is not my intention to present the advantage of any one type over another. It is strange, but no less a fact, that now there scarcely seems to be such a thing as a thoroughly bad carburetor, yet it is conceded by engineers generally that the subject of carburetion is farther from a satisfactory solution than any other vital part of modern combustion engines. The causes for this may be numerous and varied and from among these I have selected a few that are most important to the average user as points that may be clarified by a little consideration and discussion:—

Fuel.

Intake manifold.

Relation between motor and carburetor.

Carburetor adjustments.

Co-operation between engine and carburetor manufacturer.

In considering functions of the carburetor, one of the most important factors that we have to consider is the fuel supply, by which, of course, I mean liquid fuel, for it was liquid fuel used in a carburetor that has made the internal combustion engine a commercial source of power, as it is generally known. Of the liquid fuels we can eliminate from consideration all others except gasoline, which is the generally accepted meaning of the term. As you all know, par-

ticularly those in the business from its infancy, the carburetor of today is an extremely efficient device when it is compared with the first forms of carburetors, which were able to use only the best grade of gasoline, that which did not vary from the 76 test. You also know that from those times the gasoline furnished as fuel for our internal combustion engines has been gradually getting poorer and poorer in quality, meaning more difficult to vaporize and necessitating constant change in carburetor designs to meet this constantly changing quality. This brings up the question, "What are we to do as fuel users with this constantly changing supply? Will we be forced to adopt some radical change in the matter of feeding fuel to our engines, or will it be possible now to adopt some standard test fuel which we can expect will be furnished to us for a reasonable period?" Might not this subject of uniform test fuel supply be taken up with the producers of liquid fuels and some standard adopted which could be reasonably adhered to? This would give us a basis for carburetor design which would guarantee better results than we are getting at the present day, with less general dissatisfaction on the part of the manufacturer and customer. It would at the same time furnish a basis for the best method of heating carburetors or manifolds by jacketing, and lead us directly to the next subject for consideration. That of Intake Manifolds—

The detail of design of intake pipes is one point with reference to carburetion that has not received the attention its important relation to successful carburetion demands. The great variation in shape—diameters and lengths of the intake pipe or motors of equal bore and piston speed, using the same size and make of carburetors—has much to do with the variations in the results secured. The breaking up of the fuel into the largest number of particles—the fineness of the spray—is desirable for proper vaporization. It is very often the case that when the mixture leaves the carburetor it is fairly homogeneous, but as it enters the manifold its character is changed by the size or shape of the intake pipe, this causing a tendency to condense or to coagulate into globules that are not vaporized, resulting in slow burning mixtures, loss of power and efficiency, which are as a rule chargeable to the carburetor. I have found from my own experience that the changing or re-designing of an intake manifold has so materially changed results obtained, that I feel that it would be advisable to suggest to this Convention the great desirability of bringing about an intimate co-operation between the engine manufacturer as a user of carburetors, and the carburetor manufacturer, by having a committee representing both interested parties, to take up the subject of standardization of intake manifolds. This is a rather broad subject and one well worthy of immediate investigation, and one which the carburetor manufacturer will be able to assist in the most practical way the engine manufacturer. As the intake manifold is viewed today, it is more or less of a connecting medium between the carburetor and the engine—a sort of necessary evil, so to speak, partly in the domain of the engine builder, also partly in the field of the carburetor manufacturer. I think that you will all agree with me that this is a subject which is of the greatest importance to all parties concerned, and that any information obtained by this committee for the purpose of standardization will bring about immediate results in increased uniformity of operation and efficiency of both engine and carburetor.

Now let us take up the relation between motor and carburetor.

Balance between carburetor and motor, next to intake manifold, is a most important factor in securing good results and this is in a general way determined by cylinder bore and stroke, the revolutions per minute, character of port openings and intake areas. Careful consideration of these features is of the highest importance in determining the proper size carburetor, which will give the greatest range of motor speed variations without appreciable changes of air velocity at the fuel nozzle. These determinations, in conjunction with the special requirements of the motor, have not received their due attention by either carburetor or engine builders in America, as it has in Europe. This is plainly evident by the fact that motor manufacturers use carburetors of different design and make on the same type motors for motor cars and marine and stationary equipment, so it follows that there must be a loss of efficiency and flexibility in either the carburetors, the motors, or both.

Another important problem is carburetor adjustments.

Adjustments, even where the carburetor is properly fitted to a motor, plays a very important part. It is safe to say that the average operator of a motor little realizes the importance of careful adjustment of the carburetor in the matter of economy. This applies more particularly to variable speed motors than it does where a constant load is maintained. Multiplicity of adjustments will overcome some of the difficulties traceable to varying grades of fuel, temperature changes, or lack of balance with the motor, but in the long run it works to the detriment of carburetor or motor, or both, because very few users have a sufficient knowledge of the niceties of adjustment to get more than average results. Many a user will try to secure a like performance equal to that of some one he may know having a car or motor the same as he is using, and the first thing to receive attention to accomplish this is the carburetor adjustment, and in very few things is a little knowledge so dangerous as in this. Every manufacturer of motors has had this to contend with; it's the bane of his existence; the trouble is not with the user, it is with the manufacturers themselves because of their disinclination to acknowledge that carburetion and not the motor is the starting point or foundation upon which to build an efficient engine.

This emphasizes the fact that there is a lack of co-operation between engine and carburetor manufacturers, who hesitate about getting together for the purpose of solving the problems that so vitally affect and concern them. Should a committee be appointed, as I have previously suggested, there are two other very important subjects which could be advantageously considered at the same time; these are standardization of manifold and carburetor flanges for the various size carburetors, as well as bolts and spacing for the same, and second, the proper location of butterfly, or throttle valve, in carburetors, and its influence on uniformity of operation. While carburetion is conceded to be one of the most vital and important functions of the internal combustion engine, it receives little or no consideration from designers or makers until after the motors are completed. Then comes a period of testing different makes of carburetors, some of entirely different design and principle, and the one giving the best general results being adopted. This practice is neither scientific nor satis-

factory, for the reason that neither the motor or carburetor, except in very rare cases, reach maximum efficiency. No better proof can be asked than the general dissatisfaction with carburetion results among users of all types of internal combustion engines, and the constant demand for something better, something more simple and permanent of adjustment and with greater range and economy. Still further proof is the increasing demand for auxiliary devices to improve carburetion; these are entirely unnecessary, as the proper results may be obtained in the carburetor itself if properly proportioned in the motor.

The logical trend of improvement in carburetors should be toward simplicity of manipulation. The ideal would be one without adjustment. Whether that goal will ever be reached is doubtful; however, we can look for the unexpected where efforts and energies of both engine and carburetor designers are directed along the same lines. I believe it possible to obtain vast improvements when it is agreed that carburetion is the right starting point for calculation, and that the problems in designing and use of the internal combustion motors radiate from that base. I am reliably informed that a motor car manufacturer estimates \$15.00 per car as the expense to them on account of carburetor troubles. This case is not the exception by any means. A large percentage of the troubles the average user has with their motors is charged to the carburetor. This can best be illustrated by an experience with a man who had purchased a second-hand motor for marine purposes. As soon as the motor was delivered he decided to give it a thorough cleaning and overhauling. This, of course, necessitated dissembling. After satisfying himself that all was right, he reassembled the motor, discarded all old fittings, purchased new plug, timer, coil and carburetor. The carburetor was one of the best and of a well-known make. After seeing to the batteries and wiring and with the tank full of fuel, he turned on the switch, and his repeated efforts at cranking failed to get an explosion, even after priming. After several hours' hard work, during which time all manner of adjustments were made by himself and several friends, also owners of motor boats, it was the unanimous opinion that the trouble was in the carburetor. About this time I was asked for advice about what carburetor to get. My examination disclosed the fact that the piston had been put in backwards—yet the carburetor was blamed. This only illustrates one of the many conditions the carburetor manufacturer has to contend with, and no doubt it is an experience similar to what many of you have been through. This blaming the carburetor is a universal and chronic method, with the average user of gas engines whenever anything goes wrong, and whatever the trouble the carburetor is always considered at fault. Notwithstanding all the criticism of the carburetor and the general dissatisfaction with all its types, the carburetor of today is a wonderfully well operating and reliable device and should be given its full measure of credit for the successful development and operation of the internal combustion engine.

Electrical Progress.

In the battle of electricity against steam an important victory for the former agency is the announced intention of the Denver & Rio Grande Railway to electrify its main line in the near future. This, says the "Electrical Review," will be the largest experiment of the kind which has yet been undertaken in this country.

OXY-ACETYLENE WELDING.

How to Use the Machine After It Has Been Made By the Repair Man.

From J. N. Bagley, Nebraska.—In our last article we told how to make an acetylene welding machine up to charging the oxygen tank and starting the torch for the first time. Before going farther we will prepare to charge the oxygen tank. As to the acetylene tank we will consider a storage tank, or the carbolite tank as mentioned in the last article.

As to the chemicals used to manufacture the oxygen it will be best to buy them from some supply house for the local druggist will ask a price than one cannot afford to pay. The chlorate of potassium comes in one hundred pound kegs and costs from 12 to 14 cents, depending on the house you buy of. In some instances I have had the druggist ask me 50 cents per pound for this. The manganese dioxide is considerably cheaper, costing from 5 to 7 cents per pound. The oxygen is prepared by mixing one pound of the manganese of dioxide with seven pounds of the chlorate of potassium. After thoroughly mixing these two chemicals they should be placed in the generator and the cap screwed on secure. Next in order will be

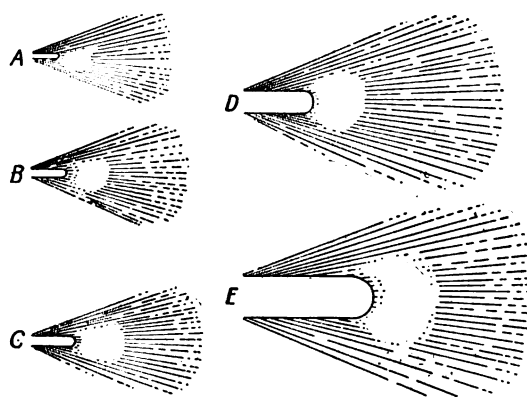


Fig. 1.

the mixture for purifying the oxygen as it is given off from the generator. This is brought about by passing it through a solution of caustic soda and water which is placed in the small filter tank. One ounce of the caustic soda to one gallon of water (soft preferred) is sufficient to free the gas of the impurities that it contains as it is given off in the generator.

Next in order will be the torches under the generator, which should be started burning. As soon as the gas starts to generate it can be heard bubbling up through the water in the small tank. This will continue so long as the chemicals in the generator are giving off oxygen gas. When this ceases the torches should be turned out and the valve closed between the small tank and the storage tank and the gas is ready for use.

Seven pounds of the chlorate of potassium and one pound of the manganese dioxide will generate in a thirty gallon boiler of about one hundred pounds of the pure oxygen, and this amount of oxygen will do a great deal of welding after the operator has had a little experience, as in learning to operate the machine considerable gas is wasted in experiment that will be saved later on.

Protecting the Eyes.

Before starting the welding torch a protection for the eyes should be considered, as the light is so intense that if some protection in the way of a colored glass be not used the practice would nearly destroy the eyesight, unless the operator had uncommon good eyes. A colored glass can be purchased from some stock house where the

welding rods and chemicals are purchased. It will cost from \$2 up, depending on the size of the glass and the way it is mounted. One should not start the welder, not even for a moment with the eyes unprotected. I have seen bystanders watch the welder for possibly not longer than a minute and when they turned to leave the building they could hardly find the door, especially if the room were a trifle dark.

The desire to light the torch for the first time should not result in slighting the making of the machine. I remember when making my welder I could hardly wait

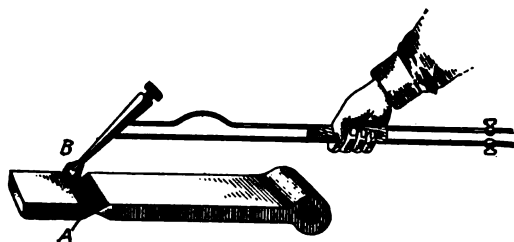


Fig. 2.

to assemble the last few parts to get the machine started. But there will be plenty of time to use the machine and all parts should be made the very best.

All in readiness, we will light the torch for the first time. In the first place, we should put on one of the smallest tips, one with a hole in it a little smaller than an ordinary lathing nail. Open the valve leading from the acetylene tank a trifle and light the flame. Gradually turn it on until the flame is burning about the capacity of the tip; that is, until the flame is just about ready to leave the tip. Now open the cock and let a quantity of oxygen into the torch. The flame at once begins to turn white as more oxygen is turned into the torch. Continue turning in the oxygen gas until the flame has come down to a small white tip about three-eighths of an inch in length. The tip should be just as long as possible without, however, having a tail to the little flame. If a little white tail is noticed on the flame it indicates not enough oxygen gas and the valve should be opened just enough to make a clean cut flame. In Fig. 1 we have the shape and size of five different sized flames that are produced by five different sized tips. The larger ones

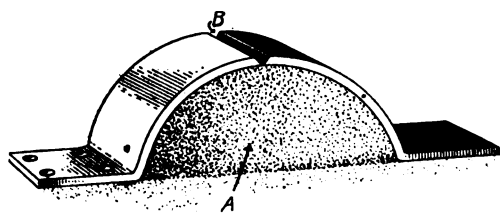


Fig. 3.

are used for the heavier work. For welding little rods and very small castings tips 1 and 2 are used. For gas engine cylinders the other three, depending on the size of the cylinder.

The First Job.

We are now ready for practical work and to begin with we will try something easy, a straight casting for instance, as shown in Fig. 2. The casting was broken as shown at B. The first thing to do with any casting is to get it in shape to weld, and a great deal of success depends on the operator, as different conditions will require different operations and preparations. All straight, as well as many irregular castings, should be ground from both sides near the fracture, leaving a V shape from both sides if possible as shown at A in Fig. 2. Now we are ready to apply the heat to the casting. Take a welding rod in one hand and the burning torch in the

other, and turn the heat on from one place to the other along the fracture until the parts begin to get red hot. Then start at one side B and hold the flame until the parts begin to melt, at the same time holding the welding rod near enough the flame to have it quite hot. Now dip the end of the welding rod into the borax and place it directly under the flame. It will at once melt and flow like liquid. Continue this across the face of the piece, being particular to leave the built up metal a little higher than the casting itself to allow for grinding down after welding.

We have now welded one side of the casting and are ready for the other. No time should be lost, for the cooler the casting gets the more gas it takes to bring it back to a welding heat. Turn the casting and weld the bottom side as the top was welded, building up a little higher to allow material to grind off, making the surface flat and smooth as before. The corners should be well built out to allow squaring up in case they were square before. As soon as the part is welded it should cool gradually, never placed in water. Many times if the metal at the weld is too hard to file it may be softened by burning sulphur on it while hot. This hardness comes from not having the mixture of gas quite correct, or crowding the weld a little too fast.

The welding rods are made of a cast composition and may be purchased of a welding supply house. Rods for all kinds of work may be purchased in different sizes,

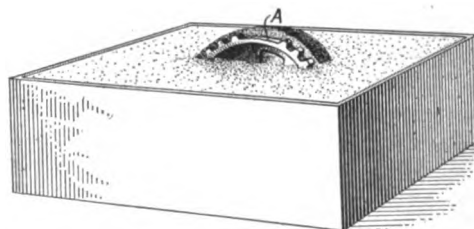


Fig. 4.

3-16 and $\frac{1}{4}$ inch being the sizes most used for the small work. They melt easily and are easily handled. As they burn down too short to handle they should be placed in a box and the pieces welded together, or a small pair of tongs made to use up the pieces.

Our next weld, shown at B in Fig. 3, is a trifle different than the one just described, and in order to retain the same shape of the casting after welding as before, we will have to proceed a little differently. An experienced welder would have no trouble in welding this shaped piece without getting it out of shape, but the beginner must not spoil a job, thus hurting his business at the outset, therefore in this case we will place the casting in its shape with the fracture placed close together and build under it with molding sand to hold it in shape. The molding sand is shown at A in Fig. 3. Now that we have the correct impression in the sand we will carefully lift the broken parts from the sand and grind the V notch in the fracture, as shown in Fig. 2, at B. In this case if the casting is not heavy it is best to grind the V all from the top side. After the V notch is ground it is not a bad idea to remove a bit of the sand directly under the fracture, allowing the metal to pass entirely through and leaving a little metal to grind away, making both sides perfectly smooth.

A great many of the smaller castings may be held in a vise while the weld is being made, while the smaller pieces may be held in position with a small hand vise. The getting the various parts in shape and holding them cannot be described or treated in print in a lifetime, as every day something new will come up different than has come to the shop before, and for this reason the operator

must have ability to figure out the best method of doing the job.

In case the casting is broken in a number of pieces it will be necessary to place the pieces together and hold them in shape with molding sand, but whatever the method of holding, the V notch must not be overlooked, as a weld that does not go entirely through will amount to but very little, as the metal will not flow through a fracture like common spelter in brazing. Flat small pieces may be placed on an asbestos board while the weld is made, and the small irregular ones can be placed on molding sand placed in a box and kept in shape for the purpose.

If the casting is in such shape that it can be heated in the forge before welding it will save a great deal of gas, besides making the job easier, and can be left in the ashes to cool gradually. After making a weld always paint the job up in nice shape as it pleases the customer.

In Fig. 4 we have something entirely different than the other just mentioned and it will be treated a trifle differently. We have a small gear with a number of teeth broken out. This may at first look a little difficult, but will be just as simple as the welds just described. In the first place we will get the box of molding sand and bury the wheel all but the extreme top where the teeth are broken out, as shown in Fig. 4 at A, only leaving the sand project above the height of the teeth, and wider than the thickness of the wheel. Now with a larger tip than used on the smaller jobs this place should be welded full, leaving metal enough above the surface to allow of grinding down to correspond with the balance of the teeth.

The sides should be first ground down to the correct thickness and we are then ready to cut the teeth in the wheel. Of course, if a gear cutter or a miller is at hand this will be an easy job, but if it is to be cut by hand it will be a trifle tedious, although it can be accomplished if pains are taken to get the teeth exact. In welding spokes in small, or even large wheels, the entire wheel must be heated good and hot; that is, hot enough to "sizz" when water is dropped onto it. If it is not heated it will crack at some point about the wheel, owing to the uneven expansion and contraction.

Keeping Nuts Tight.

Leaving locking devices out of the question for the time being, one of the commonest causes of nuts coming loose is the fact that they have never been properly tightened in the first place. When a nut is put on a bolt it should always be made certain that there is oil on the thread and also on the face of the nut. By this means the power applied by the spanner tends slightly to elongate the bolt, and this puts an elastic pressure on the nut, which is a great factor in preventing its coming loose.

If, on the other hand, a nut is put on dry, much of the power applied by the spanner is absorbed by friction, and little of it goes to compress together the parts that the bolt is intended to unite.

Another point is that a nut should be tightened and slackened several times before it is pulled up finally, as this beds the thread of the bolt against that of the nut and the face of the latter against its seat. It will be found that this will greatly prevent shock and vibration causing the nut to come loose.

A further point is that the ordinary spanner is far too short, and by means of its leverage the average man cannot apply the proper amount of force to a nut. This is especially the case where nuts happen to be in positions where it is difficult for the operator to apply his full strength.

It has been found that a piece of tube flattened so that

it slips over the handle of the spanner and thus increases its effective length by about fifty per cent. is a great assistance in putting the final nip on a nut that is so effective in preventing its coming loose, especially if the previously mentioned precautions have been taken.

It will sometimes be found that one particular nut and bolt in a car will persist in coming loose even after it has been properly tightened, and the reason is usually this: The car has been run with the bolt loose, and the latter has thus been allowed to "work" in the hole and make it out of round. The only remedy is to reamer out the hole and fit a new bolt.

THE PRICE OF GASOLINE.

And the Prospect of the Ultimate Use of a Substitute for Automobile Propulsion.

A good deal of apprehension is being felt in certain quarters as to the future price of gasoline. Thus far the price has not advanced in this country to an alarming extent, the price having been 16 cents in this city all the past summer and it is but 17 cents a gallon at present. But it is maintained that contracts with many dealers ran out on the 31st of last December and that they would not be renewed. Rather interesting is this part of the statement: "These contracts proved very disadvantageous to the oil companies in the past year and they were unable to reap the full advantages of the rise in the oil market." Supply and demand must figure in the prices naturally, for the tremendous output of motor cars has caused a much greater call for gasoline all over the world. According to estimates, the productions of petroleum last year exceeded the previous year by only 5 per cent., while the consumption has been increasing by leaps and bounds, the price has naturally raised, but not anywhere near as much as it should were the law of supply and demand allowed free action.

But the price has risen enough to alarm many dealers and car owners, nevertheless. Recently there was a big meeting of garage keepers in New York City, and some of the varying sentiments expressed are as follows:

Proprietor of the Joscelyn garage, housing 300 cars: "When gasoline was down to nine cents wholesale it gave us a fair profit; when it rose to ten cents we could add one cent without much opposition on the part of the owners, but when it took a jump to sixteen cents wholesale and then seventeen cents we could not put on the price to give us the margin of profit that we really were entitled to. Many persons who were not the least penurious, declared that it was too much for the owners to pay. They held that cost of tires, tubes and all the other accessories had been reduced greatly, but that the cost of gasoline had gone up. The objection was so general that we could not put on the additional ten cents a gallon. That of course cut our chance of making any profit to almost nothing, and if the cost is raised to a much higher figure it will mean that thousands of persons will be driven from the field and put the automobile once more in the luxury class. It will become unprofitable for the business man, real estate man and various others to use their cars with any such tax on them. With the gasoline going up the only solution the garage man can see ahead of him is to raise the price of storage to about \$50 a month."

Theodore K. McCarthy, said that every cent increase in the price of gasoline meant the loss of

\$10,000,000 a year to many of the collateral industries in the building of an automobile.

"A one cent increase," he declared, "means that the garage man has to meet it with a corresponding advance to his customers. Twenty-five cents a gallon now keeps many a man out of the automobile field, and this is felt all down the line of automobile manufacture. The leather goods man feels it, the tire maker, the body builder, the mechanic and every accessory man is affected to some degree. Gasoline has now reached such a high figure that further jumps will prohibit the use of the car. When it was selling wholesale for nine and ten cents the owner acquiesced in a ten cent profit to the garage, but with it going higher and higher almost daily this additional raise cannot be advanced ten cents to the consumer."

Samuel D. Love, of the Belnord Garage, called attention to the difference in the grade of gasoline that is being supplied now and that sold eight and nine years ago. He said that the garages and automobile owners were powerless.

"Last December," he said, "I paid \$700 more for gasoline than I did in the same month a year before. That represented a loss to me of about \$400 on the month, because I was not able to get ten cents a gallon profit without running the risk of losing many of my best customers. The situation is getting worse and worse and the only possible hope I can see against the future is for the introduction of some other fuel. Kerosene will not solve the difficulty, because it even has been increased in price and by the time a kerosene carburetor was adopted universally the price of kerosene would be on a par with the advance in gasoline."

Chalres H. Potter, of the Uptown Garage, showed that the garage man has been caught between two fires, in trying to give his customers a shade the better of the bargain. "Eight or ten years ago," he said, "the average man who ran a machine on the average of 700 or 800 miles a month faced a monthly expense of \$100 to \$125. Today, through the lowering of the cost of tires, tubes and all other incidentals, this has been cut almost in half, and nowadays he will cover the same territory approximately on \$45 or \$50 a month—some of them at much less, although this is the exception. Cost of live storage has remained practically the same, \$25 to \$35, according to the size of the car and the style of the body. Rents have gone up wondrously on buildings adaptable for garage purposes, fire regulations call for the installation of costly apparatus to insure safety, high class labor is at a premium and now gasoline has gone to such a figure that we cannot get our margin of ten cents a gallon. If you will take almost any garage in the city, estimate the floor space to each car and the rental paid, you will find that practically every cent of the storage paid is eaten up. Further increase in the price of gasoline will work a hardship on many garages."

W. E. Dusenberry, vice-president of R. M. Owen & Co., said: "Increasing the price of gasoline certainly will hurt the industry. It will deter many a man who intends to purchase a car, because he will think he is unable to stand the great advance in the cost of maintenance."

George Stowe, vice-president of Carl Page & Co., said: "The gasoline situation has become very serious. Mayor Fitzgerald, of Boston, aroused by the increasing cost of gasoline, has advocated the establishment of central distribution stations where oil and gasoline may be sold at a slight advance on the cost.

There is no reason why this is not feasible. Competition among the oil companies has dropped to almost nothing, and within the last three years we have not been importuned for trade by any company other than the one we are dealing with. The price of gasoline has come to be a big factor in the operation of a car, and increasing the price will injure business."

H. J. Benjamin, president of the Auto Truck Storage and Exchange Company, said: "We are up against a limited competition. I am an optimist about the price of gasoline, and if the companies raise me I raise my customers. I went down to the Texas company this morning and protested, but found that there was no redress, that they were allotted a limited amount of gasoline for this territory. It is not the garage that is to suffer; it is the owner."

G. A. Tisdale, president of the Franklin Motor Car Company, said: "Increase in the price of gasoline will work harm to the general industry. The gasoline is not as good now as it used to be and is about one-third kerosene. We have found it to a test as low sometimes as fifty-six per cent. We are all against the increase. While our seven passenger cars will get eighteen miles out of a gallon, the price paid today is too high."

All this has naturally directed attention to the possibility of adopting some other fuel, and the matter is stirring up more discussion in Europe than in this country, for there the cost of gasoline is much higher than here.

We saw a device two years ago that would run an internal combustion motor most satisfactorily in every way, as far as could be observed by a superficial inspection. The motor was first started the ordinary way by gasoline and then the kerosene was admitted. The motor immediately increased its speed after the use of kerosene for fuel was begun, and one might hold a cambric handkerchief over the exhaust and it would not be soiled. Moreover, the firm which was exploiting this new converter stated that it would be installed at no cost whatever on trucks if the owners would pay for the use of it the amount the new converter saved in fuel expense. For some unknown reason, however, the device has not yet come into general or even partial use on motor car or trucks.

The aim is to run on either kerosene or a combination of gasoline and kerosene, but neither the kerosene nor the combination of fluids is suitable for the existing types of motors and carburetors. Nor are the opinions of experts hopeful of kerosene as a fuel, as a rule, except with new models and construction of both carburetors and motors, as will be seen by the following:

Wheeler & Schebler, Indianapolis, Ind., The Schebler Carburetor. "It is our opinion that it will not be possible to have a carburetor for kerosene which will in itself do all the necessary work for automobile practice. We believe that it will have to be a combination of motor and carburetor in order to get the desired results."

Holley Brothers Company, Detroit, Mich., the Holley carburetor. "In our opinion the trade is not ready for a kerosene carburetor. If you can place us in connection with any firm who can use 5,000 kerosene carburetors, we will agree to furnish them with a device which will successfully operate with the same certainty that an engineer will plan and build a bridge or watch. It is simply a question that is up to the manufacturer."

The Air-Friction Carburetor Company, Dayton,

Ohio. "We wish to say we have had this under consideration for some time, and as a result constructed our carburetor so that it is very convenient to use a low grade of kerosene. We have a motor which we use for test purposes here in the factory and are running it altogether on kerosene, and have been getting fine results."

The difficulty of using kerosene is that it will not vaporize readily at ordinary temperatures, and before it will evaporate sufficiently to form a gas with air, it must be heated. This calls for specially constructed vaporizing devices and jacketed manifolds. Also, owing to its low rate of evaporation it is claimed that it cannot be used successfully on high speed motors where flexibility of control is desired, or rather where the engine must be accelerated from its minimum to the highest speed in a short time. On the other hand, on slow speed motors, such as are used for stationary and marine service, kerosene is being used successfully. Again, its combustion is not apt to be so complete as is the case of gasoline, and it thus deposits more carbon in the combustion chamber.

Next, turning to alcohol, it has been found that this is less volatile than gasoline and requires more heat to vaporize it. Alcohol vapor can be compressed more than gasoline vapor but it gives out less heat when burned under the same conditions. It has not been applied with success to motors designed for gasoline use but with a new carburetor design and a new form of motor it may possibly be found economically available. The present form of carburetor and motor use twice as much alcohol as they do gasoline to develop the same amount of energy. The amount of air necessary to secure complete combustion of alcohol is estimated at one-third that of gasoline, but twice as much compression is needed. As is the case with kerosene, it is difficult to start an engine when cold with alcohol, as it is not very volatile unless heated.

As gasoline is more volatile than alcohol, and evaporates quicker, alcohol has a less fire risk. Gasoline will set on fire objects considerable distance away, while the heat from burning alcohol goes upward; gasoline fire is spread by water, while burning alcohol can be extinguished by water. Some authorities claim that the present rise in the price of gasoline will result in alcohol being used as the fuel of the future, while others are looking more hopefully toward kerosene. Then there is the constant improvement in electricity as a propelling power.

In any event, there is no occasion for special apprehension. Gasoline has not thus far raised in price at wholesale more than five or six cents a gallon. "Sufficient unto the day is the evil thereof."

Exercise by Proxy.

The fickle nature of popular crazes is shown in the almost total cessation of bicycle riding as a pastime in this country—and the renewed interest in bicycle riding as a professional sport. A week or so ago Madison Square Garden in New York City was jammed to its capacity almost every night during a six-day professional bicycle race. It looks as if an increasing number of Americans were willing to take some of their exercise by proxy, especially when this is accompanied by the excitement of strenuous competition.

A vibrator adjusted too lightly will cause "skipping" or misfiring with the consequent loss of power.

A FOOT WARMER.

Not Difficult to Make and It Is an Inexpensive Luxury.

During the cold weather comfort often requires some method of keeping the feet warm while riding in the automobile. If the feet and hands be kept warm there is little discomfort in riding during the coldest weather. Here follow the details of an electric foot warmer that is used successfully in England. There is no reason whatever why such a device may not be applied here. It has an advantage over heated bricks, hot water bottles, and chemically filled warmers.

The electric foot warmer requires no preliminary heating; it can be put into operation in a second, and when heated up it maintains a constant temperature. It takes little room, its initial cost is small, the upkeep and cost

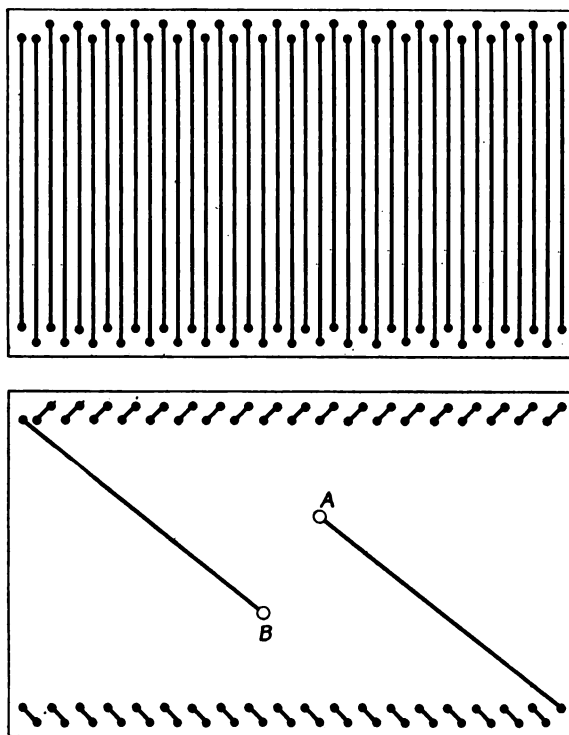


Fig. 1.—Diagram of the wiring of an electric foot-warmer, showing front (top) and back (bottom.)

of running are nil; for these reasons it claims to be an ideal accessory and an inexpensive luxury in cold weather.

It is presumed, of course, that this foot warmer will only be used on cars which are fitted with a magneto or dynamo; it could only be run at considerable expense from battery alone.

The materials required for its construction consist of a slab of slate 10 in. x 6 in. x $\frac{3}{4}$ in., about 22 ft. of galvanized iron wire 20 gauge, a yard or so of stout double flexible electric cable and two cheese head screws $\frac{1}{2}$ in. long, screwed $\frac{1}{4}$ in.

Having obtained the slate, mark off and drill a series of holes, 5-64th or 3-32nd, $\frac{1}{2}$ in. apart and $\frac{1}{4}$ in. from the long edge, then another series $\frac{1}{2}$ in. from the edge, arranging them as shown in the accompanying diagram. They may, of course be drilled all in line but if arranged as shown there is less tendency for the slate to break along the edge. A similar series of holes should also be drilled on the opposite edge.

With a hacksaw make a shallow cut across the slate between each opposing set of holes; this cut should be of

sufficient depth to allow the wire to lie flush with the surface of the plate. Now turn the plate over and drill and tap two holes for the two screws; this having been done, the wiring may be commenced.

The center of the length of wire is now found, and the wiring started from the center of the plate and continued to each end. This is easier than starting from one end and wiring to the other. The diagram shows how the wiring should be done to get all the possible wire on the front or top of the heater. After wiring to each end, the loose ends of the galvanized wire are led to the screws A and B, the holes for which are already made.

All that is now necessary is to fix one end of the flex to these screws, one strand to each, and the slate may then be covered with any piece of felt or other material at hand, and the foot warmer is complete. In its home-made casing it is shown in the photograph reproduced.

A simpler but no so effective way to wire the slab is to cut little slots along the edges of the slate at intervals of $\frac{1}{2}$ in. and wind the wire round the slab. Wound in

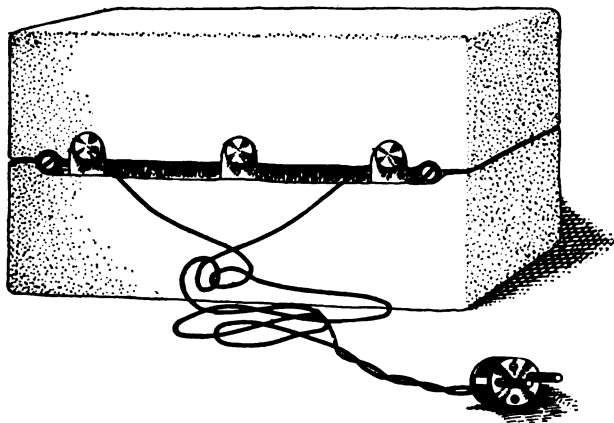


Fig. a.—The home-made electric foot warmer in its felt casing. The flex and plug are seen attached.

this fashion, the plate will take longer time to warm up, as the wires are equally divided between front and back, the terminals then are at the extreme corners, and the plate must be covered before the flex is attached, otherwise there is danger of shortcircuiting and consequent damage to the battery.

If the plate be wired as in the diagram, more heat is immediately available when the battery connection is made, as practically all the wire is on the face and the danger of shortings, which is present in the other suggested arrangement, is entirely avoided.

It is desirable that some means of readily connecting and disconnecting the other end of the flexible cable to and from the battery be provided, and an ordinary plug and socket connection which may be bought for 1s., is perhaps the simplest way, the battery being permanently wired to the socket and the warmer to the plug.

To put the warmer into operation, the plug is inserted in the socket, and in a few moments a gentle heat is felt; the heat attains its maximum when the plate is evenly warmed through, which takes about twenty minutes with the dynamo running. When it is thoroughly heated up it will retain its heat for an hour or more after it is disconnected, which is done by withdrawing the plug from the socket.

If the quantity and gauge of wire be somewhere near what is above specified, the current required will be about 4 amps. at 12 volts, and even if the voltage rises to 15

there is no danger of the wire on the heater burning or singeing the cover.

It is possible, if the dynamo fitted be small and the lamps large, that there may not be sufficient current to run heater and lamps simultaneously; if the lamps, however, be large, it is likely that a dynamo of at least 100 watts is installed, and this should just run the lamps and the heater at the same time; a slightly larger dynamo will do so easily.

EQUIPMENT OF 1913 CARS.

Devices Which Make for Greater Safety and Ease of Operation.

Visitors to the 13th National Automobile Show in Madison Square Garden and Grand Central Palace, New York, were amazed at the advance made in pleasure car construction. This does not mean radical changes in mechanical construction, but refers to the complete equipment being offered. The visitor at the show found that fully 90 per cent. of the car manufacturers are furnishing their cars with more essential accessories than ever before. This equipment includes devices which make for more efficient operation and ease of control of the car with less labor for the driver.

Only three years ago but two manufacturers furnished self-starters with their cars, this year there are scarcely a dozen out of nearly 200 pleasure vehicles that are not equipped with some form of motor starter which does away with the laborious and dangerous method of starting the car by hand. These starters may be divided into five classes as follows: Electric, compressed air, acetylene, gasoline or other volatile liquid and spring starters. At last year's show 33 per cent. of the cars on exhibition were equipped with acetylene starters; 41 per cent. with compressed air or gas and only 36 per cent. with electric starters. This year it is estimated that more than 50 per cent. of the cars have electric starting lighting systems.

One manufacturer of accessories exhibits an electric starting and lighting system which consists of a separate generator and motor. The generator may be driven from any suitable part of the engine while the electric motor is designed to be placed either on the transmission housing or at the front of the engine. The electric motor weighs only 24 pounds and is rated at one-third h.p. It has a fly wheel at one end and at the other a worm which meshes with a worm gear driving the motor shaft or the transmission shaft. In this starter the back-kick is taken care of by an ingenious arrangement. The worm gear is slipped in the shaft and held in position only by friction under the tension of a spider spring similar in construction to the shock absorber made by the same company. The tension is sufficient to transmit the power but in case of a violent backfire from the engine, allows the shaft to rotate backwards without doing any damage.

Another electric starting and lighting system combines the electric motor and generator in one unit and stores surplus current in a storage battery. When the car is running the unit acts as a generator, supplying sufficient current to light all of the lamps as well as for keeping the storage battery up to its rated capacity. When the battery is fully charged the current is cut off by means of an automatic switch, which prevents the battery from charging back into the

generator. When the car is to be started the generator acts as a motor and engages the fly wheel through a set of sliding spur gears, turning the motor over until it takes up its regular cycle firing operations under its own power. This is accomplished merely by pushing a small button on the toe board.

There has also come a wide production of lamps of special designs, especially adapted to automobile use. They are dust and water proof and, of course, are operated from the driver's seat merely by touching a button or electric switch.

An important trend in design was seen in the adoption of wire wheels which this magazine was first to note and approve. At last year's show only one company exhibited wire wheels while this year no less than five wheel builders show them. Two of these have demountable rims which is a step in advance of European practice, while the rest have special devices which allow the wheels to be placed and locked on the hub in a "jiffy." Several new designs of wood wheel demountable rims are shown.

Gasoline motor builders had something new in the way of six-cylinder machines while several radical designs in valve construction were placed on exhibition. There is one motor in particular which has been taken up and extensively discussed by the American Society of Automobile Engineers. It has crescent shaped sliding valves which operate in grooves cut into the cylinder walls. These valves are actuated by means of box cams, one set on either side of the cylinders. This new motor is said to have extraordinarily high compression and to develop great power at moderate speeds. While the older motor companies have not made any startling changes in essential design, they have made their motors extremely neat and clean in appearance. This includes the complete enclosing of the valves in cages, covering the electric wires in conduits and providing better means of mounting the intake and exhaust manifolds, the magnetos and the pumps.

Last year only 13 per cent. of the cars shown had the steering wheel located on the left hand side of the car. In the majority of these cases the control levers were centrally located although a few had the levers at the left of the driver. This year about 30 per cent. of the cars had left hand drive while many of those cars which retain the right hand drive have adopted the center control levers. Such an arrangement allows access to the front seats from either side of the car.

Electric signalling devices, speedometers, bumpers, shock absorbers and numerous other accessories all of the latest design including several new makes seen for the first time, were shown.

This year brought with it the greatest variety in body designs ever before brought together for the criticism of the motoring public. Almost every car manufacturer is prepared to equip each of his chasses with a half-dozen different types of bodies, including the touring body of different passenger capacities, the roadster, the torpedo, coupe, limousine, landaulet or berline.

This year the prices of cars ranged from \$395 for the smallest two-passenger runabout to \$7,300 for the largest limousine or landaulet. One company showed a vestibuled suburban car of the limousine type, handsomely upholstered, electric lighted and heated, comfortable as a parlor.

Subscribe to the Automobile Dealer and Repairer.

PAINTING POINTS.

Three Important Considerations Involved to Insure a Good Job of Work.

From M. C. Hillick, Pennsylvania.—To the car owner who elects to do his own painting three main considerations are involved, namely: Proper surfacing or smoothing the work up previous to painting, smooth and fine application of the paint and color, and plenty of good varnish applied for the protection of the under coats.

Even though the car is sent to the professional painter for painting and varnishing repairs it is important to insist upon having all the work done in a thorough manner. There has been altogether too much slipshod painting applied to the automobile with the result that complaint is being every where made that while the American painted car is for a brief time at least, a thing of beauty it is not "a joy forever." Attractive painting of the car does not, therefore, necessarily mean simply beautiful colors protected by a radiant garment of varnish. It embraces a fine measure of surfacing, every new or old coat of paint being worked down as clean and smooth as a hound's tooth, and a just and fair balance given to each individual coat. That's what the term attractive painting means, and it is precisely what the car owner when he put his car in the care of the painter should insist on having applied to his car.

It matters not whether the car is home painted or professionally painted the first essential thing is to clean the mud, and dirt and foreign matter from the surface and then sandpaper the old paint structure—or the new, for that matter—right down to hard pan. Slick off every particle of dozy pigment; work everything down to a smooth, hard under pinning of paint. Fractures showing decay need to be cut out with the putty knife so that finally, when the work of surfacing is all complete, the remaining paint film is strong and firm and well knit. Then dust off and apply a first coat pigment containing 30 per cent. raw linseed oil which will serve to give a good foundation bound tight and strong to the old. Upon this coat when dry putty all surface defects such as gouges, fractures, coarse patches, etc. Use a quick, hard drying putty that can be sandpapered 24 hours after application.

If the surface is in good condition and not much broken up it will pass along without having more than one more coat of surfacing pigment. For this second coat use white lead, colored up to meet the shade of the final color selected for the car. Work both of these preparation coats very smooth upon the surface, sandpapering each coat separately along with the putty. This will serve for your foundation for the color and for all the coats coming after. In the event of the surface being checked and chopped up some with age and hard usage use the coat containing the 30 per cent. linseed oil, putty in due time on this, and then in as many days apply three coats of rough stuff bought ready to use. Let this foundation of rough stuff dry hard and secure, and then rub with artificial rubbing stone and water. This represents the two principal methods of bringing the old paint surface up to a condition suitable to put color on. They will do more than anything else to produce attractive painting. The car owner should understand that above every other factor the primary surfacing—the working of all the old coats of paint down smooth and fine—counts for most.

Having secured this, the next step is to get the color coats on in nice, clean condition, all brushed out in one direction free from runs and sags. Choose appropriate colors. Above all, do not use too many colors and so spoil the effect. Put on some neat striking lines if pos-

sible; if not competent to put the lines on true and uniform omit them altogether. One or two good coats of rubbing varnish, each coat carefully applied and put on without runs or draperies, these topped off with a good solid coat of elastic body finishing varnish should suffice, and will suffice under reasonable conditions, to bring out not only a durable but an exceedingly attractive finish. Each of the two rubbing coats of varnish should be rubbed with pumice stone flour and water, using a half-inch perforated felt pad to rub with. This produces what is technically known as "a surface," i.e. smoothness and levelness which is the object of the rubbing.

The chassis or running parts in the meantime need to be brought along by first cleaning them with turpentine, or some cheaper fluid detergent, sandpapered hard and smooth and given a coat of the oil pigment used for first coating the body. Then putty and in due time again sandpaper. Follow with one coat of color, one coat of varnish color, apply lining work, then one coat of clean rubbing varnish, rub with pumice stone flour, clean up and finish with a hard drying varnish impervious to soap.

A MARVELLOUS GROWTH.

A Veteran in the Automobile Trade Indulges in Some Reflections of the Past.

From Col. George Pope, Automobile Board of Trade, New York.—The last couple of seasons, when on the opening night of the National Automobile Shows, I have watched motor enthusiasts throng in to see a mammoth display of cars and accessories, I could not help but marvel over it all. To me it scarcely seems possible that this can be the same world, which thirteen years ago was practically unacquainted with such things as automobiles. A magnificent, colossal display of beautiful models which tell the tale of evolution and improvement during the past thirteen years is seen—several million dollars' worth of goods. It is a demonstration of the near-perfection attained by a comparatively new industry—concrete evidence of the phenomenal strides made in it in a few years, thanks to the earnest effort and brains of hundreds of brilliant men and also to the fortitude and courage of many men, who had such confidence in the possibilities of the automobile that they invested their fortunes—small and large—in it. Some made money in producing a type of vehicle that would benefit mankind; others gamely lost their all in experimenting with inventions which did not work out as hoped for and through it all, makers benefited by noting one another's successes and failures.

The industry became a great melting pot as it were, and the law of the survival of the fittest was ever to be noticed on all sides. Thus, of all the earlier designs tried out, practically every maker uses a vertical type motor of either four or six cylinders; the motor (with the exception of only a couple of makers) is water-cooled; all agree on putting the motor in front instead of the rear, or under the seat as many tried to do, etc., etc. It is wonderful to think how automobile construction has become standardized.

In 1897 when I was in the bicycle manufacturing business, about the time when the bicycle industry was coming to a crux—that is a period when its boom was about over—I can recall how at a bicycle show in Madison Square Garden, there was a "horseless carriage" exhibited. That was what self-propelled vehicles were called in those days. It was a curiosity.

Probably not 5 per cent. of the people who looked at it would have been willing to ride in it, let alone learn to drive it, for it was generally considered a dangerous contraption. The fact that it developed about 5 h.p. did not alter the case any. Assuming that a self-propelled vehicle was dangerous in itself, the wisacres declared there was nothing in it as an industrial proposition.

The following year several cars were shown at bicycle exhibits in Chicago and New York, and still more were displayed in 1899. However, the first really serious attempt to hold an exposition of automobiles purely on their merits and not as a side issue of another sort of exhibition was held in 1900 and Madison Square Garden was its setting.

At that first show there were fifty-one exhibitors all told, thirty-one showing complete cars and a score displaying accessories. Needless to add, there was plenty of spare room in the huge Garden—so much room that the promoters did not know what to do with it all. It has been quite different the last few years when, using the galleries, basement and the halls and practically every nook and cranny to be found inside the structure for exhibition purposes, there has not been enough room to accommodate all who are eligible to exhibit.

At that first show there was one feature that was a good one and very much needed at the time, although today it would be unnecessary. It was designed largely to fill up space in the arena. This was a flat oval track for the purpose of demonstrating cars. During the week of that show many persons received their first ride in an automobile, riding around that ring.

How we would laugh at some of the cars shown that year! Most of them were steam cars and electrics with a few gasoline vehicles thrown in. How little we really knew about building automobiles in those days was evidenced by the fact that it was thought steam automobiles would be the predominating sort of cars in years to come and gasoline explosive motors were scarcely thought of; whereas, the progress of the industry has shown the very reverse, the steam car being now practically extinct.

Some of the cars shown in 1900 were amusing contraptions. The Winton Company, for instance, exhibited a phaeton which would seat two passengers. This car made a fine run from Cleveland to New York, a wonderful achievement twelve years ago, and there was also shown the famous Winton racing car of that day and a delivery wagon. All these were driven by single cylinder gasoline engines. A one-cylinder Packard car and a three-wheeled contrivance made by the Knox Company, also were included in the gasoline division. One real racy looking car was a two-passenger motorette constructed by the Peerless Company. It employed an imported De Dion motor. There also was a surrey displayed by the French Brothers, and it attracted considerable attention because it had come down over the roads from Boston. Messrs. Haynes and Apperson were then in partnership and their vehicles were examined with much interest and curiosity. The only three-cylinder engine was mounted in a car shown by the now defunct American Bicycle Company. Easily one of the leaders was the Locomobile—but at that time a steam vehicle—and no less than ten different models were on exhibition.

Many were enthusiastic over the electric vehicle that year. The Riker Motor Vehicle Company

showed some cars with storage batteries as the power source that were really creditable productions for those early days. The Riker Company some time after was taken over by the Electric Vehicle Company. The Woods Motor Vehicle Company of Chicago were represented strongly, as well as the Baker Motor Vehicle Company, which had furnished the sensation of the show by producing a 500 pound electric runabout equipped with a battery weighing only 160 pounds. There also were a number of motor-bicycles and three-wheeled machines.

The following year, 1901, there were ninety-three exhibitors at the Garden and the show was quite an improvement over the first one. There was no track on the main floor, the demonstrations were given in the basement and outside the building. This was the first time an aggregation of foreign cars were gotten together, five different makes being present.

Each succeeding year until 1905 the strides were most marked. In the meantime the National Association of Automobile Manufacturers had been organized and the co-operation of this body added a great stimulus to the industry. The fifth show saw an increase of 200 exhibitors over the first one in 1900.

After the year 1905 the Automobile Club of America withdrew from the promotion of the Garden show, the Association of Licensed Automobile Manufacturers coming into existence that year and from then until last year all of the shows were under A. L. A. M. auspices. Of course, as it is well known, the A. L. A. M. was dissolved early in 1911 following the Seldon patent suit settlement in the courts and the Automobile Board of Trade became the Association's successor.

Certainly the pages of history of the industry from the time of the first show through its infant stage and then the A. L. A. M. period of development up to the present year form as interesting a romance as can be found in any line of industry anywhere in the world. Just as great poets and great statesmen were laughed at before they came into their own and grew famous, just so the automobile industry was laughed at in its early days by capitalists and hard-headed business men.

Adaptability of Motor Trucks.

Every manufacturer of either gasoline or electric trucks and light wagons has adopted the plan of building the entire running gear and driving mechanism as a complete operative unit independent of the body. There is usually no connection between this chassis and the body except the bolts necessary to hold the body in place on the frame. Any desired style of body can be mounted on any chassis, within certain limitations of size and weight.

A comparatively recent development with truck manufacturers is the making of each model in several lengths of wheelbase and frame length to take short, medium, long and extra long bodies. The only difference in construction between these is the length of the side frames, the drive shaft, brake rods, etc. Thus, a truck of any given load capacity can be fitted with a short, strong body for carrying hardware, machinery or other heavy material; medium length body for ordinary service, like the express business, general hauling, department store work, and so forth; or with very long body for boxes and barrels, beds and mattresses, cornices, theatre scenery, etc.

These and many other different types of bodies

were seen on the new models of motor trucks and delivery wagons exhibited at the New York Automobile Show. One maker alone who manufactures only a 3,000-pound capacity vehicle showed eleven different styles of bodies on his machines just to indicate the great diversity of application. Other manufacturers also made the most diversified exhibits possible, and salesmen in attendance at the different stands were provided with albums of photographs showing scores of other applications and body styles, from fire department apparatus to funeral cars.

Aside from merely building special bodies to mount on standard chassis, the truck maker often goes to great lengths to give a customer a work vehicle especially suited to his needs. By designing and fitting to the chassis special mechanism he gives the contractor and coal dealer trucks with dumping bodies operated by the truck motor; or he constructs a short, strong tractor that can be coupled to a pair of steel-tired rear wheels to act as a trailer for hauling extra long timbers, rails or structural steel beams. Such trailers can be connected to hook and ladder trucks, standpipes or even steam fire engines to take the place of horses.

A new type of gasoline truck with front wheel drive exhibited at the show for the first time has no machinery whatever back of the driver's seat, which makes it possible to attach a pair of rear wheels and very low dray type body commonly used around docks. Emergency wagons for street railway use are built with turntables that can be elevated by a crank or by power from the motor. Trucks used by electric light and power companies and by safe and machinery concerns have powerful winches that can be driven by the vehicle motor to haul cable through conduits, stretch overhead cables, set up tall electric light poles, hoist safes to upper stories of office buildings, load and unload heavy machinery, and so on.

Tank trucks for handling oil in bulk are common. Similar vehicles equipped with pumps driven by the vehicle motor are employed for street sprinkling, while recent novel applications are machines for spreading hot crude oil and tar on street surfaces. A large vinegar and pickle concern has just bought a motor truck with power pump for hauling vinegar in bulk. Both centrifugal and reciprocating pumps driven by the truck engine are built into machines for use as fire engines.

Thus, the motor truck is not merely a substitute for horse-drawn vehicles but is an independent self-moving power plant that can be adapted to many special purposes that cannot be accomplished by any other single means.

Some Inner Tube.

From C. B. Emerson, Porto Rico.—I was coasting a 10 per cent. grade in a five-passenger Autocar, when I heard a strange noise behind me and I brought the car to a slow standstill, saw an object as big as a cement barrel very closely associated with the hind wheel. This object was going through the contortions of a sea serpent nature at each revolution of the wheel. The snap ring had come out of its channel, and had allowed the inner tube to jump out all at once with 80 pounds' pressure on it. The valve was opened as soon as possible and (strange as the fact may seem) I have been using that same inner tube for over three months without repairs; which goes to show that some inner tubes are better than others.

Automobile Dealer and Repairer

A Magazine of condensed and compact information for busy readers.

PUBLISHED THE MIDDLE OF EACH MONTH BY

THE MOTOR VEHICLE PUBLISHING CO.

71-73 Murray Street, New York

Telephone, 6765 Barclay

Post Office Box, 654

Entered as second-class matter at the Post Office in New York City.

M. T. RICHARDSON, President and Treasurer.

A. A. HILL, Editor.

F. R. WHITTEN, Secretary and Advertising Manager.

TERMS OF SUBSCRIPTION.

One Copy, One Year, Including Postage.....\$1.00
One Copy, Six Months.....60 cents
Single Number.....10 cents
Foreign Subscriptions.....\$1.50, or 6s. 8d.

Remittances should be made by Express Money Order, Draft, Post Office Order, or Registered Letter. Foreign remittances, where possible, by International Money Order.

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NEW YORK, JANUARY, 1913.

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IT ALL HELPS.

"Sweet are the uses of adversity" is a familiar and doubtless a true adage. But prosperity as well as adversity has its uses, as has happiness as well as sorrow, and praise as well as blame. In fact, whatever Providence sends us is undoubtedly useful and helps to create the well-rounded character.

The weakening of character is when a balance of the opposing qualities named is not maintained. Too much prosperity creates pride and arrogance, and too much adversity cringing and debasing humility. As we have before stated, nature abhors extremes, and the law of balance is a great stimulation to the development of moral and physical excellence.

Both the praise and the blame that our readers give us in their interesting letters are of value. The praise is a spur to increased courage and greater effort and the blame to more care and a proper humiliation of spirit.

Thus it is all received with due appreciation, although we must admit that we like the praise better than the blame, because it is always gratifying to feel that effort makes for success.

We are trying to aim high, for with Browning, we feel that it is better to have "failed in the high aim, as I, than vulgarly in the low aim succeed."

PUNISH ALL ALIKE.

Some of the New York newspapers are howling because "a drunken man cannot be sent to jail for knocking you down with an automobile," to quote the words of a "scare" headline from one of them.

But why should a drunken man be punished more severely for knocking any one down with the car he is driving than a sober man? It does not hurt any more to be knocked down by a car driven by an intoxicated man than by one driven by a sober one.

Legal punishment should be meted out to all alike—drunken, sober, young, old, high, low, rich, poor, bond, free. It should fit the crime, not the criminal. The moment we begin to depart from this good old-fashioned practice, we get into all sorts of trouble.

And we have come to the conclusion that there should no more be a law forbidding a drunken man to drive an automobile than there should be one forbidding him to carry a razor or revolver, or a poison. Indeed, we are not sure but that drunken individuals should be encouraged to carry such things, and to use them—on themselves.

Now do not misunderstand: We have said, and it is here repeated, that it is unwise to employ a man to drive a car who indulges in the use of intoxicating liquor. Nor is it wise to employ a careless man to drive a car. Yet some drunken drivers are as trustworthy as some careless ones.

In our boyhood days one of our neighbors often got intoxicated, but he always drove home safely from the village with his spirited horse, while a total abstainer neighbor was continually having accidents with a less spirited animal, and simply because he was reckless and inconsiderate.

Drunkenness is a prolific cause of crime. But greed is a cause of crime, human passion is a cause of crime, and so are other qualities and weaknesses of which selfishness is the moving impulse. We were about to repeat the old adage that "drunkenness brutalizes a man," but this is not true; it only brings out the brutality that lies down deep within him. You can't get anything out of a man that is not in him. Lovers of Thackerary will recall Col. Newcomb—he of blessed memory—the only perfect gentleman in all fiction. Although this gallant, simple, clean-minded man took more liquor on occasions than was good for him—as indeed any liquor at all is more than is good for any one—yet he was always courteous, considerate and high-minded.

But we are wandering from the subject. There is but one way to mete out justice to those who endanger the lives of others when driving automobiles and that is to punish all alike and all with extreme severity. The present conditions require it.

ROAD INFORMATION.

From the U. S. Department of Agriculture we have received a booklet containing reports of experiments in dust prevention and road preservation, made during the year 1911.

These experiments are of undoubted public utility and the Agricultural Department itself is one of the most useful of all government services. But the report referred to, like most government reports, would be of far more value if the results were summarized so that the reader could easily determine which seems to be the best method of dust prevention and road preservation. Or, if no methods with which experiments were made seems to be best or even better, the comparative value

of each might easily have been stated in a few hundred words.

Another fault of government reports is that they are usually much belated. Reports of experiments made in 1911 should be in the hands of those interested before the end of the year 1912.

NO RUBBER SHORTAGE.

Our readers have doubtless seen something in the press in relation to a substitute for rubber. This artificial rubber is said to have been produced by the "polymerization of isoprene," which means about the same as combining isoprene with other chemicals, if we are not mistaken. Isoprene is made from starch.

Attempts are also being made to successfully regenerate rubber, but it is said to be impossible to eliminate the sulphur without destroying the molecule.

It will thus be seen that although man can cause Nature to improve upon itself, he is unable to manufacture the identical thing that Nature easily produces.

But no apprehension need be felt. Natural rubber is largely increasing despite its enormous increase in use. Those who are in a position to know say that in a very few years we may rely upon 76,000 tons of wild rubber annually and 98,000 tons of plantation rubber. This is likely to meet the requirements of the civilized world for all purposes.

In a statement issued by Samuel P. Colt, president of the United States Rubber Co., attention is called to the prices of automobile tires, which are considerably lower at present than they were a year ago. Commenting upon this feature of the rubber market, President Colt declares that the profits of the rubber company are still very satisfactory, owing to the fact that the price of the raw product is continually declining. The decline is due chiefly to the fact that the production of crude rubber in the Far East is increasing at a rapid rate. The offerings in London at the bi-weekly auction sales are considerably larger than was anticipated.

The United States Rubber Co. already has about 25,000 acres planted with rubber trees, the company owns upward of 80,000 acres and will continue to put out trees as rapidly as possible. Some of its trees will be in a producing state within a short time.

Ordinarily the vibrator should be set much stiffer for magnetos than for batteries as the life of magnetos is not affected by excessive demands for primary current. The stiffer adjustment will cause a hotter spark and consequently more power; this is one of the many advantages of the magneto.

The secondary windings of coils are often punctured or broken down by operating the coil with the high tension circuit open, or by trying to cause long sparks by increasing the spark gap over $\frac{3}{8}$ of an inch in the open air. Coils are also broken down by allowing excessive currents to flow in the primary coil.

Preignition makes itself known by a peculiar metallic or ringing knock in the cylinder. Excessively advanced ignition produces the same hammering or knocking. The cause of preignition should be removed immediately.

Tires require care during the winter owing to their being subjected to moisture. They should be examined from time to time for cuts and if any be discovered they should be vulcanized.



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1037

Engine Goes "Dead."

From James E. Ells, Jr., Connecticut.—I would appreciate it if you would answer the following questions:

1st.—I am driving a 1908, 3-cylinder, Elmore, that has given me first rate service, but during my three years' driving of this car, I have had an occasional (very seldom) case of the engine going dead without any apparent reason whatever, and I have been unable to determine the cause, neither can the local agents tell me. I will say that this car is equipped with the Atwater Kent system, and when the engine goes dead, if I reach over and quickly turn the switch off and on two or three times, that it will start again before the car has had a chance to come to a standstill, and will run for hundreds of miles perhaps before it will happen again. Does this give you any hint as to the cause, I can tell you of nothing else?

2nd.—Do you think that a more modern carburetor would increase the power of this car? The carburetor now on being of the 1908 style.

3rd.—Would one of the later styles of the Atwater Kent system prove to be more efficient than the 1908 style?

4th.—This car has now been run nearly five years. Do you think it would pay to have cylinders reground and fitted with new pistons?

5th.—Would it pay to heat the carburetor?

6th.—Do you think that any of the devices for vaporizing the gasoline between carburetor and engine are good? I have tried one with no results.

7th.—And last, about steam cars. As a possible purchaser of a new car, I will say that I am very strongly inclined toward a steam car, such as the local agent is handling, the Stanley. I have ridden in one, have talked with those who have bought them, and they seem to be well liked, and they certainly can do wonders. But I judge that you think that they do not begin to compare with a gasoline car. Will you kindly state a few of your reasons?

Reply. 1.—The 1908 Elmore is a two-stroke-cycle motor, and as we recall uses crank case compression. We are surprised to learn that it is still in good running order, but not surprised that the old Atwater Kent system has probably become impaired from long use. A motor that stops such as you describe can usually be found to cease operation from interruption of ignition. 2.—We do not care to advise change of carburetor in two-stroke-cycle motors, as this is a very peculiar proposition, the application of carbureting devices to this type of engine not being so well understood generally as is in four-stroke-cycle. If the

engine will run at all—let it alone. 3.—It is but reasonable to suppose that a 1913 model would be better than one five years old. 4.—Not unless you have new bushings fitted to the crank shaft bearings. It would be found to be an expensive operation, and one not to be attempted by every mechanic. 5.—Probably be best to provide a connection from around the exhaust pipe to get a supply of pre-heated air. 7.—We must courteously decline your invitation, to make comparison of gasoline and steam cars.

1038

Rear Cylinder Misses.

From George Sinamark, Nebraska.—I have a 1911 International "30" which always misses in the rear cylinder whenever the motor is cold, running with the magneto. If I switch to battery, it will run on all four, but this cylinder will not work with the magneto until the motor begins to get warm. Once it is warm, there is no trouble, except occasionally on a very hard pull. Compression is as good as it was before the trouble. The valves have been ground and the carburetor and spark plugs have been changed with no effect. The magneto is a Splitdorf low tension. The timer, distributor, piston rings and wiring have been overhauled. Sometimes racing the motor will start the cylinder working, but it will miss again when speed is reduced. Can you tell where the trouble may be? I have had an extra air inlet valve attached to the intake manifold, between the carburetor and cylinders. It is operated from the seat. Sometimes it gives extra speed and power to open this a certain amount. But the instant it is open I get the ordinary blue smoke from the exhaust. This smoke keeps coming as long as the air valve is open, but stops as soon as I close the valve. No repair man has ever been able to explain the cause of this smoke to me. Can you? Have been told that the use of an extra air valve of this kind is injurious to the car. Is this so, and if so, why is it?

Reply.—Closing the spark plug gap slightly may make ignition more regular in the rear cylinder. Looks to us as if the inlet valve stem guide was badly worn, resulting in too "lean" a mixture in that cylinder. We cannot suggest any possible cause of the trouble as far as the ignition system is concerned. If the compression of that cylinder is at all impaired it might cause the trouble. The auxiliary air inlet valve will usually give added power and we do not see how it can affect the motor injuriously. A blue smoke ordinarily indicates excess oil, while black smoke shows excess gasoline. It may be that gasoline is "trapped" in the inlet manifold and the air from the atmosphere carries some of it into the cylinders. The International car is manufactured by the International Harvester Co., and owing to the fact that it is not advertised to any great extent in motorcar papers, comparatively little is known of the car in general by the automobile trade.

1039

Motor Chokes on High Speed.

From John C. Hirschy, Indiana.—I have a 1911 "30" Marion touring car. In all, it has run only 2,000 miles and never had any trouble until about eight weeks ago when the motor would choke on intermediate and high speed. Up to 15 miles it runs fine. When the motor is stopped, it forces about one-quarter of a pint of gasoline through the air intake of the carburetor. I have had the car at several garages and although the garage men could find nothing wrong with the carburetor, they advised me to send it to the

factory for repairs. The motor is in good condition; valves tight; compression fine, and the ignition is all right, but after the carburetor (a Schebler 1¼ inch Model "L") was tried out after being repaired at the factory, it was the same old story of throwing out a lot of gasoline through the air intake when the motor was reversed by the compression in stopping. The only thing accomplished by sending it to the factory is a repair bill for \$3. The motor in the 1911 "30" Marion cars is an Overland, the same as used in the 1913 "30" Overland cars. My carburetor has no hot air or hot water connections, and you may tell me that my trouble is caused by the low grade of gasoline, but there are hundreds of cars here running under similar conditions, using the same gasoline and Schebler carburetors.

Reply.—It looks to us as if the carburetor adjustment was not properly made, and owing to the fact that the gasoline is not all vaporized it accumulates in the inlet manifold from which it is blown through the carburetor fixed air inlet as the motor is reversed during compression in one cylinder. It might be that the carburetor float action is somewhat impeded by a bent gasoline inlet float valve lever pin, which would give you a higher level of gasoline than proper, possibly accounting for the "loading" up of gasoline in the inlet manifold. You could prove whether or not the fault is in your carburetor by exchanging it for another 1¼ inch Schebler Model L, and there certainly ought to be plenty of them in the "hundreds of cars" running thereabout. The only way for gasoline to get into the inlet manifold is through the fuel nozzle. A 1-inch carburetor might give you better results than a 1¼-inch, if you persist in not connecting up a heated air supply.

1040

Cleaning the Crank Case.

From Dr. P. H. Seibel, California.—Do you consider the following method of crank case cleaning any way injurious to the parts contained therein? Viz.: Drain off all oil from crank case. Flood the same with kerosene to its fullest capacity and allow it to remain for one hour, during which time occasionally spin the motor so as to draw kerosene to the cylinder walls, etc. Then drain the crank case of kerosene, replace oil, open priming cocks; again spin motor and allow the car to stand twenty-four hours before starting the motor. Inasmuch as practically all oil has been removed from the cylinder walls, would it be advantageous to inject about a tablespoonful of cylinder oil through the priming cups into the head of each cylinder to insure lubrication of walls, pistons, etc., before attempting to start the motor?

Reply.—It would be advantageous to inject a tablespoonful of cylinder oil into each cylinder through the relief cocks, and to insure the oil not remaining on the head of the piston a mixture of about one-half gasoline and one-half cylinder oil will be found efficacious.

1041

An Ignition Phenomenon.

From Martin Swanson, Wisconsin.—I am a repairman and have repaired many makes of cars, but must ask you for some information concerning the Buick cars.

I have been working on a Model 10, Buick with a Remy magneto, jump spark. The battery box is located on the running board and is made out of steel. It does not touch any metal, but it nearly touches the

bottom edge of the front fender. At night when the car is running on battery or magneto, sparks can be seen jumping between the battery box and the fender. I have tried all kinds of ways to locate this trouble, but can find no remedy. Wires from the coil to the magneto and engine are O. K.

I have put in new batteries and relined the box with heavy rubber all around and on top, also put in new battery wires that run to the coil that is covered with heavy hose rubber, so it can't get grounded any place on the battery box. The car can be running perfectly without a miss for a long time but the sparks can be seen and then again it can miss badly.

On another new Roadster, 1912, Model 35, Buick, I have noticed once in a great while sparks between the top of the radiator and the hood, but have had no trouble with the car. If anybody can tell me how to remedy this, I would be very glad to hear from them.

Reply.—High tension electric current will perform some very queer stunts sometimes, and this freak is one of them. We think you can learn the cause of this sparking if you will follow this reasoning, taking first the battery circuit. The current leaves the positive pole of the battery, passes through the switch, the spark coil, the interrupter in the contact box and back to the negative battery terminal, which provides a path for the intermittent flow of the low tension battery current. This current in passing through the jump spark coil induces a high tension current in the very fine secondary coil winding. This secondary current travels from the secondary winding to the distributor on the magneto, and then to the insulated electrodes of the spark plugs, leaps the spark gaps in the plugs and as no other means are provided, it completes the circuit through the motor itself and to the spark coil primary terminal, to which the other end of the fine wiring is connected, thus establishing a metallic circuit with the exception of the spark gaps at the plugs. From this it may be noted that primary and secondary currents are traveling over the same primary wire, two separate currents. If now the primary current should happen to be traveling in one direction, and the secondary in the opposite, the secondary current might seek some other course rather than against the direction of the primary current and might jump from the fender to the battery box, then through the insulation of the primary wire connecting the battery and coil and follow this wire to the coil to complete the circuit for the secondary or high tension current. The first spark coils brought out had two secondary terminals, and it was customary to connect one primary with the corresponding secondary terminal and lead the cable from the other secondary terminal to the plug. Sometimes in single cylinder engines a better spark could be produced by running another cable from some good contact on the motor to the other secondary terminal, instead of connecting the two terminals. In the battery circuit the current always travels in the same direction, but in the magneto, which generates alternating current the flow is first in one direction and then in the other, in the Remy magneto giving four alternations at each revolution of the armature shaft, although it is rarely that any more than two are utilized in a four-cylinder motor, either the first and third or second and fourth half wave of current being interrupted to cause the spark. We can understand why the current jumps when on battery, but why on magneto is more puzzling. We should suggest that you change the battery wire connections, disconnect-

ing both battery terminals and reverse the polarity, giving the battery current the opposite direction through the coil and primary winding. The jumping of the spark when running on the battery may be a result of utilizing the negative half waves, instead of the positive. We are not so sure, however, and shall be pleased to hear the views of some of our readers as to why this phenomenon occurs.

1042

Two-Stroke-Cycle Engines.

From M. D. Schwendener, New York.—I have built nine different models of two-cycle engines. Three of these were single cylinder, three were three-cylinder and three were two-cylinder engines at present I am making the drawings for my Model Ten which will be a two-cylinder water-cooled three port engine of nineteen calculated horsepower.

I consider the two-cycle engine the ideal engine for use in either automobile, motor cycle, launch, or airship on account of its extreme simplicity, steady torque, larger power as compared weight for weight with the four-cycle engine, and owing to the absence of all valves, cams, gears, and such other truck as clutters up the ordinary four-cycle engine; their unexcelled sturdiness and freedom from trouble.

There is only one fault which I can find with the two-cycle engine and it is the fact that it seems impossible to make a multi-cylinder engine to run without missing when running idle or under a very low throttle with but very small load. All of the six multi-cylinder engines which I have built and all other multi-cylinder two-cycle engines which I have observed act the same way. When running idle or under very low throttle with but small load they will miss for two or three revolutions and then the explosion will come with more than double the ordinary violence. This causes vibrations and jars which are not pleasant to behold and which do not materially benefit the car. If the carburetor is adjusted to give a richer mixture they will run with a four-stroke-cycle and consume an extraordinary amount of fuel. On the other hand, if the fuel supply is cut down they will run beautifully for perhaps four revolutions, then comes a crank case explosion which drives all the accumulated oil out of the crank case, so when the load is again put on, the engine runs dry until another supply accumulates.

Now I want to ask if there is any multi-cylinder two-cycle engine extant which will run evenly idle and if so what means are employed to make it do so?

Also do you know of any means to make a cold engine start on kerosene? I have the design of my engines worked out so far now that they will burn kerosene just as well as gasoline if not better; at any rate they have more power on kerosene and will deliver over eleven horsepower hours to the gallon, but to start I must run for at least three minutes on gasoline.

Reply.—From your inquiry we judge your experience has been altogether with enclosed crank case engines, as the symptoms described are very familiar to practically every one who has had any extended experience with two-stroke-cycle three-port motors. There may be some such motor as you are seeking, but we doubt it. Two-port two-stroke-cycle motors can be made to run much more slowly than three-port, but are not capable of such high speed. We do not know of any means for starting a cold engine with kerosene except that it be run for a few minutes on gasoline or some other fuel-like natural or city gas.

1043 May Be Too Much Gasoline.

From O. D. Loomis, Illinois.—I have a curious trouble. I have a Winton K machine, Stromberg type B carburetor, which starts every time on the half turn. It will run on good roads with the spark and gasoline closed, although the gasoline is set a little rank at the carburetor, but it will develop but very little more when the spark and the gasoline is advanced. That is my trouble and there are no experts close by to fix it. The compression is good and the gasoline keeps its level in the carburetor under speed. There are no leaks to allow air to get about the carburetor. The grade of gasoline is good and the carburetor is regulated, or supposed to be, by an expert and it has not been fooled with. It runs by dry cells (new ones), the plugs are kept clean, it has good, new wire, and new master coil (Splittorf). Each engine works alone by testing at the coil, the exhaust is clean from smoke, and I know I don't burn too much gasoline, as about $\frac{3}{4}$ inch level shows in the glass, which I am told is right. It developed great power up to six months ago; yes, three months ago.

Reply.—Your car was originally equipped with a $1\frac{1}{4}$ -inch Holley carburetor. The model is of the year 1906. From your description of the symptoms we should say that the gasoline supply is excessive at all speeds. No doubt the valve stem guides are badly worn allowing air to be drawn in with the throttle partly closed, and when the throttle is opened the mixture is so rich. It is extremely hard to give advice on cars so old as to be practically forgotten except by veterans in the business. See our reply in this issue to F. W. Elliott, Ohio.

1044 Trouble With the Mixture.

From F. W. Elliott, Ohio.—I have recently purchased an old Winton 45 h.p., $4\frac{1}{2}$ -inch piston, with a $1\frac{1}{4}$ -inch Schebler carburetor, in apparent good condition, patent Oct. 14, 1902. It did flood for a time but by shellacing the cork float and inserting a leather washer, I make the gasoline stand just about $\frac{1}{4}$ of an inch below the point of the needle, but I can't get the right mixture. The engine won't start with good compression, good spark, hot water and priming with gasoline in the carburetor and the needle adjusted in any position. I have been thinking some of buying an Air Friction carburetor made at Dayton, Ohio, for about \$11. What is your advice in the matter? Where is the Rayfield carburetor made, and what is your opinion of it and its price?

Reply.—We are unable to place your 45 h.p. Winton car. It may be a Model D of the vintage of 1905, 24-30 h.p., or a Model K of 1906 rated at 30 h.p. At any rate the Winton agents here in New York say that both these models were originally equipped with $1\frac{1}{4}$ -inch Holley carburetors. It is our opinion that the Model D Schebler carburetor will have to be replaced with a more modern designed carbureting device, one that will be able to vaporize the much heavier gasoline than when the car was new. We do not believe you will be able to get the engine to operate satisfactorily without replacing worn parts, such as valve stem guides, piston, piston rings, etc. In other words it will probably be necessary to have the motor practically rebuilt by someone who knows how to do the work. We cannot advise you as to which carburetor to select for obvious reasons. The Rayfield is manufactured by Findeisen & Kropf Manufacturing Company, 21st and Rockwell streets, Chicago.

1045 Result of Wear.

From William Fletcher, M. D., Wisconsin.—I have a Buick Model 10, 1909, I believe, is the year of make. I have trouble with the spark plugs sooting and refusing to fire. It seems to be due to over oiling. Has any way been discovered to avoid this, or even help it? I use A B C plugs and Polarine oil. If I run the oil just so it shows in the glass, then I have the least trouble.

Reply.—We are strongly of the opinion that excess oil, which from your symptoms is indicated, is a result of worn piston rings or poorly fitting pistons, from the fact that the car has been in use four seasons. If such is the case the rational remedy is new rings and probably new pistons or cylinders. It is possible that the heavy grade Polarine oil, if you can obtain it, would help you somewhat, maintaining a better "pack" between the cylinder walls and piston rings, would not splash so much in the crank case and would not be drawn into the combustion chambers of the engine by the partial vacuum found when the throttle is partly closed.

1046 Lighting from the Magneto.

From H. C. Dolson, Illinois.—I have a Ford touring car and after having considerable trouble with the acetylene generator, I put on electric headlights. My garage man says it will make my car give me no end of trouble by getting my coils out of adjustment. What is your opinion of the matter? Can some other magneto be attached to furnish ignition and retain the other magneto for lighting? If so, could I in that way do away with the coils?

Reply.—The Ford Motor Company do not advise against the use of electric headlights in connection with the Ford ignition magneto but furnish a diagram of the wiring. There are several manufacturers who regularly advertise Ford lighting systems, some using the Ford magneto and others separate electric generators. We do not believe that electric headlights operating on current from the ignition magneto will affect the vibrator adjustments or cause such trouble as you fear. You could, at considerable expense however, have another magneto, of the true high tension type, geared to your motor to furnish ignition without the use of coils, but it would be simpler to have the lighting magneto new, as it would not have to be gear driven or engine timed, and simplex to use the present magneto for both purposes. A Master vibrator with a set of non-vibrating coils will be found preferable to four vibrating coil units.

1047 Needs Better Compression.

From Sam Bryzon, Nebraska.—I am operating a Waukesha four-cylinder 4x4 gasoline engine, and it is giving me considerable trouble. It uses a lot of gasoline and makes the water boil in a little while. It is equipped with a Model E Schebler carburetor and Pittsfield coils, with battery ignition. The compression is fair. Had the cylinders cleaned of carbon, the water circulating system inspected and made all possible carburetor adjustments, but with no good result. The needle point is projecting about 1-32 inch through the nozzle of the carburetor on one-half turn of the needle. Has this some effect on the gasoline raising too high? Where should the air velocity be greatest through the carburetor to vaporize the gasoline the best?

Reply.—Your story is told very completely when

you say that "The compression is fair." No changes or adjustments will avail you until you have your compression good and well fitting pistons, piston rings and valves, for the reason that loss of compression spells loss of power, increased fuel consumption and heating of the motor to such an extent that the circulating water has insufficient radiating surface in the radiator to keep the motor cool. You need new rings anyway, probably new pistons and possibly new cylinders. It is hardly probable that there is sufficient metal in the cylinder walls to have them rebored or reground. The Model E carburetor will not handle the heavy gasoline of today as well as the later Models, L and O. It is perfectly proper for the adjusting needle valve to project through the jet opening. It can have absolutely no effect on the gasoline as you infer. The air velocity should be greatest at the vaporizing nozzle, and in the Model E Schebler carburetor the fixed air enters through the center of the float bowl and completely surrounds the vaporizing nozzle.

1048 Outlived Its Usefulness.

From E. J. S., North Dakota.—We wish a little information in regard to a Maxwell Runabout, No. A3919. We bought this car second hand and it can't be used much. We have trouble to get the mixture so that both cylinders will explode. If we set the needle valve so that the right cylinder works good, the left cylinder won't explode. If we open the needle valve one full turn, the left cylinder will explode regular but the right cylinder, won't explode at all. But if we turn the needle valve half way between, they both explode, but they miss often and have no power. We are using the carburetor that was on the machine. We have also tried a Schebler but it seems to make no difference. When we have both cylinders exploding and take off the feed the one entering the right cylinder will be quite wet with gasoline and the one entering the left cylinder will be perfectly dry. If you can give us any information how to correct this defect we will appreciate it.

Reply.—Your car is an early model and for all it "looks good" it probably has outlived its period of life and usefulness. Double-opposed motor car engine design is now practically obsolete, largely on account of some of the symptoms you describe, inability to get the proportion of air and gasoline vapor the same in both cylinders. You may be able to help matters some by using air heated from a jacket around the exhaust piping, and a connection to your carburetor, but we fear your case is practically hopeless without you have the engine overhauled and the worn parts renewed which would cost more, in all probability than the entire outfit would be worth when the job is completed.

1049 Simply Impossible.

From B. F. Stoner, Indiana.—Can I use the Columbia storage battery, which I am using to start my engine, and then switch on to the magneto to blow my Sampson electric horn at the same time? The battery is 6 volt. My machine is the Mitchell, Model K, 1909 car, equipped with Splitdorf magneto and coil. I tried wiring the horn to the battery terminals, the same as the Splitdorf wires are, but could not start the engine while the horn was connected to the battery. If it can be wired to use both, give instructions how to wire together. I have had but little trouble

with my car. Am using the same tires I started with July 3, 1909.

Reply.—You cannot wire your Splitdorf magneto to operate both the horn and the ignition system, for the reason that the horn connections short circuit the primary current and such a connection is practically equivalent to the function performed by the switch when in "off" position.

1050 Just a Bit Unreasonable.

From G. O. Helvig, Minnesota.—Please let me know what size Model L Schebler carburetor will give most power, viz.: The correct size for a single-cylinder four-stroke-cycle automobile engine, 5-inch bore, 6-inch stroke, 600 revolutions per minute. After getting the correct size Schebler carburetor, would any other make of carburetor be correct, using the same size for the same size engine? Please give rule to find correct size carburetor for any size automobile four-cycle engine.

Reply.—Wheeler & Schebler, the manufacturers of Schebler carburetors, in a recent circular recommending the proper model and size of carburetors for different sized engines of 5-inch cylinder bore, single- and double-cylinder, advise the use of 1¼- or 1½-inch, Models D, E or L, while for four-cylinder engines Models L or O are recommended, 1½- or 1¾-inch capacity. The speed of 600 r. p. m. is very low for an automobile engine, and on this account we advise the 1¼-inch size. While the Model L has more flexibility than the Model D, and on this account is better adapted for high speed motor cars than Model D, for marine work where an engine is driven at top speed the Model D is considered to be fully as powerful as Model L. There unfortunately is no established standard of sizes for carburetors, and there are so many different elements entering into the proper proportioning of various carburetors to different design of engines that we prefer not to go on record in saying that the proper size of one make would be the proper size for another, although such should be true. There is no recognized established rule for proportioning carburetors, nor do we think it possible to work out one that would fit conditions of engine design and carburetor principles employed. Might just as well try to evolve one medicinal prescription to fit all ages of patients and "all the ills to which flesh is heir."

1051 The Motor Skips.

From L. J. P., Connecticut.—My 1912 Overland 59 car, which has been run only 1,600 miles, has acted fine until the last 200 miles when the motor began to skip, especially on starting and on going into high. Now the motor stops when running on the magneto if the spark is advanced very little. It runs all right on the battery. Have looked over the wire connections and experimented with the carburetor without benefit. The grease from the differential also works out into the brakes. Is this due to the felt washers being worn? The front cylinder seems to accumulate carbon more rapidly than the rear ones. In storing the car for winter would you advise removing the tubes from the casings and the casings from the wheels?

Reply.—It would have been a simple matter for you to have told us with what magneto your car is equipped, but it is so seldom that queries similar to yours give any definite information as to make of carburetor and magneto, that we are despairing almost.

On investigation we learn that this car is equipped with a Splitdorf low-tension magneto with a step-up or transformer coil, also batteries. The production of the spark is effected by the same mechanism, no matter whether magneto or battery current is being used. As the same interrupter is used, the same distributor, the same coil, the same secondary wiring, the same switch and a part of the same primary wiring, it is but reasonable to suppose that the magnets of the magneto are partially demagnetized. In retarded position the spark from the magneto is stronger than when advanced, and when advanced is probably not sufficiently strong to ignite the charges of gas when compressed. It is possible that shortening the gaps at the spark plug electrodes may help you some, but we think you will find it necessary to send the magneto to the nearest Splitdorf service station to be remagnetized, which is 20 West 63d street, New York. The leakage of grease may be due to worn felt washers, or it may be due to heat generated as a result of the driving and driven bevel gears not being absolutely in line. The excess of carbon in the front cylinder may be due to more missed explosions in that cylinder, or excess of oil in the timing gear case. In storing for the winter block up the axles so the wheels will be clear from the floor, let out part of the air and keep all light possible from the casings. All grease should be cleaned from the shoes before leaving them.

1052

Carburetor Trouble.

From Thomas P. Page, North Dakota.—I have a Model 10, 1908, Buick runabout car that has run altogether about 7,000 miles. This car is today practically as good as new and has always given perfect satisfaction. It had a Kingston carburetor originally. This summer I was induced to replace this carburetor with a type B 3-1-m Stromberg. There came with this carburetor three needles, 59, 60, 61, I think. After placing this carburetor on the car I had my first trouble with the engine. I found it would run fine when going slow—from 4 to 5 miles an hour; also run fine from 15 miles an hour up. But when opening the throttle, however careful I might be, from a real slow speed to a medium speed, this engine would flood. It would almost die down, snort around for a few seconds, and then go off fine again. I thought I might have some air leaks, so had the engine overhauled, put in four new intake valves, new valve springs all around, had the outlet valves ground, but this did not remedy the trouble. I have needle 61, the smallest of the three needles, in now. I have heard the Stromberg people make a 65 and 64 needle for this carburetor which will remedy the trouble. I am told by repair men that the 1912 Stromberg is different from the 1911 model, as it has a hood that projects down over the needle. I have had all the expert repair men trying to adjust this carburetor, but none of them can do any good. Any advice will be thankfully appreciated.

Reply.—Your car is at least five years old, and before making carburetor changes you would have done well to have consulted the maker of your car, who is presumed to know more about carburetor needs and sizes than any one else. This inquiry should have been referred to the Stromberg Motor Devices Company, 64 East 25th street, Chicago, if you were unable to satisfactorily adjust according to directions. From your description of the symptoms it looks as if the adjustment for slow speed was not properly made or that the nozzle opening is too large,

and as a result in either case unvaporized gasoline accumulated in the mixing chamber. Then as soon as the throttle is opened this "raw" gasoline is pumped into the cylinders "flooding" them. The number of the needle refers to the size of the hole therethrough. It is probable that a smaller nozzle may remedy the trouble. You can but try. The Stromberg Motor Devices Company, like all manufacturers of carburetors, are continually improving their product.

1053

Heats and Loses Power.

From G. C. R., Texas.—I have a Brush runabout, Model B C, which has not the power it ought to have and for some little time when the spark is advanced there is a sharp metallic knock which ceases as spark is retarded. But when it is retarded there is not enough power. It will also be running smoothly, but when it comes to a hill it will begin to knock especially if it is cold. I also notice at times when it is pretty warm I can advance the spark quite a bit without the knock until I come to a hill when it sets up again. It is equipped with a Heinze Coil. Would you think the Unit system would help me out very materially as regards power and the knock? In other words, would it increase my power? I might add that compression is very fair and have put new contacts on coil and new wiring complete. I have no trouble in starting and the motor runs smoothly until the spark is advanced beyond the fourth notch. But it has to go further than that to get the amount of power required to make anything like a pull or get any speed.

I also have another trouble I would like to have your advice on: The motor runs hot; will boil the water in ten minutes whether it is pulling or not, and invariably does that, and I can find no cause for it. My valves have been ground only recently and seem to seat smoothly, and as far as I can tell the water jacket is open. However, the latter is rather a difficult matter to be positive about as I can't see any further than the opening of the inlet and outlet. Is there any way of testing this, and if so how?

Reply.—Heating may generally be attributed to the burning of too much gasoline or imperfect radiation. We suspect that your compression is poor, due to either worn piston rings or "scored" cylinders. If this is the case no change in the ignition system would help you. Your admission that "the compression is very fair" seems to solve the problem, as you have loss of power and probably your consumption of fuel is more than it was a while ago. You can test your water jacket by removing the radiator connections and pouring water through the engine jacket. Do not, however, put any pressure on the water, for you would be liable to burst the jacket. The thermosiphon water system has to have a perfectly free and unimpeded jacket space and water connections.

1054

Yes, to Both Queries.

From T. M. Kelly, Minnesota.—Can you recommend Se-ment-ol to put in radiators? I have a 30 h.p. Regal car which is very hard to start in either warm or cold weather. I would like to know the reason. Do you consider the Regal car a standard car?

Reply.—Yes, we have reason to recommend Se-ment-ol, judging from the verdict of those who have used it, and we consider the Regal car a very good one for the price. If it starts any harder than other standard cars, it is due to the one who starts or cares for it, and not to the fault of the car.

1055

A Steam Car Query.

From William J. F. Runkle, Pennsylvania.—I have a White steamer five-passenger 1905 car. What kind and grade of gasoline or kerosene is best to use? I have been using 72 per cent. gasoline. Which is the best? Some people tell me that coal oil or kerosene will work as well as gasoline. If it will, what kind and grade? What is the best way to drive the car in the winter? The car is new to me and I hardly know how to run it properly. Please advise.

Reply.—There is more heat in 62-degree gasoline than in 72-degree, gallon for gallon. There is no such a grade as 75 per cent. If you use kerosene you will need a special kerosene burner, for which 130 or 150 degree fire test may be used. For general driving instructions send for the White instruction book.

Pro and Con of Tire Protectors.

From Gerald E. Griffin, Kansas.—There are a few things connected with tire protectors that ought to be made known to your readers, the readers who make your paper possible. While on a vacation in many of the eastern cities, I tried to find a car with protectors in use but failed. Finally, last fall, I met a man in Kansas City who had a pair of rear wheel protectors in use. Said he to me "These protectors are not what they are cracked up to be. I intend to take mine off when I get a good chance. Don't buy. Bare casings are as cheap in the end and they give better satisfaction." Now with all this evidence, negative and otherwise, I invested in a full set of protectors, for an automobile fool and his money are soon parted. Moreover, he has few gleams of intelligence until he has learned by the route of useless expenditures.

It is almost needless to state here that all my garage acquaintances advised me against tire protectors. I put the protectors on my Ford car and the "first rattle out of the box" it refused to take the hill outside of my house "on high" with its usual load of four light passengers. I cut the load to three and at that it had a hard fight "on high" to make the top. I wouldn't believe it was the protectors, but placed the blame where it did not belong, on the engine. Such, of course, is automobile intelligence as you all know. I began to experiment and kept at it for fourteen days before I was forced to admit, even to myself, that I had been "stung" with these protectors so far as the comfortable use and pleasure of the car was concerned. This is what I discovered in the fourteen days: The protectors reduced the capacity, or power, of the Ford car on hills by one passenger weighing about one hundred and thirty-five pounds.

They use up nearly one-fourth more gasoline in overcoming the resistance offered to smooth progression. They make a noise on hard pavement especially brick, that sounds like a heavy fall of hail and which attracts the attention of pedestrians. On passing fences, telegraph poles and similar objects, the noise given out by the protectors is echoed with such vigor that one thinks there is a fender loose. The protectors cause melting of "wet" patches on inner tubes when run at twenty-five miles per hour over pavements during average fall weather. The noise they make on pavements when top is up is deafening; so bad, indeed, that one has difficulty in distinguishing the rhythm of the exhaust. They cause the car to start sluggishly and they kick up as much dust as the suction of the bare tires.

After finding all this out, I took the protectors off principally because the women of the family would not ride with me with them on. I offered them to the manufacturers for half what I had paid for them and offered

to prepay the express charges. They refused to consider my offer. Is the knowledge I gained worth it? I think it is. The tire protectors are hanging in my garage. They are in first-class shape.

(Note by the editor—Our friend has stated with considerable force the disadvantages of tire protectors, but he has failed to mention any of their advantages, much less their chief advantage. Few use or recommend tire protectors on new casings except to prevent skidding, and for such purpose quick detachable chains are usually employed. These are readily removed when not needed, and when they are needed, they are like the somewhat proverbial western "gun" needed so badly that lives are often dependent upon them. But the kind of tire protectors referred to by our correspondent is usually applied to weak casings or shoes which have been worn to the fabric. When so used they are very useful in securing greater service from the weak tires, which would otherwise have to be discarded. Tire protectors undoubtedly necessitate slightly greater propelling force to the car, just as heavy and more durable tires of any kind increase the necessary force required to propel the car, but gasoline is far cheaper than good rubber. A high grade set of tires cost as much as a thousand gallons of fuel, more or less, and if used when such a set of tires must otherwise be discarded, they are a decided saving and an economy. But we must take exception to one thing more from our correspondent. He says he was unable to find tire protectors in the east. He could not have looked for them very closely. They are of very common use in this part of the country. Nor do all garage men advise against their use. Let us free ourselves from prejudice in considering this as well as all other matters where there are two sides to the question. That tire protectors are an economy as well as an appliance for safety will not be seriously questioned; that they have disadvantages will not be questioned, likewise.)

Fast Driving and Overloading.

From Frank Strobel, Illinois.—I have run a Moline five-passenger 30 h.p. car 8,000 miles. Had one blow out, no punctures, and my tires are good yet. I have run 36 hours straight, stopped only long enough to get oil, and something to eat. When I start for any place, I do not try to see how soon I can get there, but drive as carefully as I can and get there in time. My idea is fast driving causes all tire trouble and engine trouble. Somebody may want to know what I call fast driving. Fifteen miles per hour on some roads and 20 to 30 on other roads, but when you drive fast enough to make your car rattle and vibrate you are driving too fast. I always go over my car when I come from a drive or before I go out for a drive to see if all nuts are tight. Overloading a car is bad. I have seen four and five in a two-passenger car and seven to nine in a five-passenger car. If a spring should break or have a blow out, then the owner would say he had bad luck. I say he was foolish to overload his car.

After Running Four Years.

From E. Anthony, Iowa.—My car is an Oakland. It has been run four years and has never been in a garage and has never had to be pulled. It runs just as good today as it did the day I got it and is on the road every day that is fit for a car to be out. Never saw the inside until last Spring so I went at it myself and took it apart. The gearing and cogs were just as good as the day they were put in.

THE CHICAGO SHOW.

Another Great Exhibition of Automobiles and Accessories from February 1 to 15.

The management of the Chicago Automobile Show, held annually in the Coliseum and First Regiment Armory, and scheduled for February 1 to 15, 1913, has always been conservative in its advance statements concerning its scheme of decoration and equipment. It has established a reputation for doing the thing in pleasing style, and therefore prefers to furnish an annual surprise and allow the public and the exhibitors to draw their own conclusions as to its merit.

It has been the policy of the management to present some completely new plan each season and so far there has never been a duplication of an earlier effort. This year will prove no exception to the rule. Both of the buildings will be decorated in a manner never before attempted in any exposition building, and, to accomplish this result the management will make use of material previously used only in connection with the Chicago show and then only in an experimental way.

Strangely enough the New York show management has hit upon a name for its scheme which, but for that fact, would have been applied at Chicago. It is to be known as the Crystal Palace. The plans will, nevertheless, be entirely dissimilar. The Chicago plan will run rather to Cathedral glass and stained window effects than to crystal.

The extremely ornate effects which have been marked features of the center of the Coliseum in the past will give way to more imposing over-head effects. The principal features of the decorative scheme will be found in the ceiling and on the balcony front. Extending from side to side and from end to end, completely enveloping roof, girders and every particle of the overhead construction of the building will be a gorgeous painting of which the principal feature will be twenty-six stained glass windows, each 22 feet square. Each window will be of a separate design, in each case a reproduction of some classic work of art. These will be so brilliantly illuminated as to stand out in strong contrast with the remainder of the ceiling, and this despite the fact that the entire building will be as brilliantly illuminated as heretofore. Tests of the scheme already made in the building go to prove that the effect will be the most remarkable of its kind.

The balcony front, a length of 1,000 feet and to a depth of about 10 feet, will be similarly treated but the pictures will be of rural scenes. There will be three of these in each of the twenty-six sections between the girders of the building. All of the pictures will be framed in massive settings, forming a scene at once impressive, dignified and pleasing.

Beneath the balcony the walls will be paneled in mahogany frames enclosing plate glass mirrors which will be used extensively also in the ceiling above them. It was from this feature that the show might have properly taken the name of the Crystal Palace. Mirrors will be used in profusion though care has been taken that they shall not offend good taste. In addition to the walls and ceiling they will adorn massive posts erected below the balcony to disguise the iron girders which support the roof and gallery. These columns will, of course, be ornate and in keeping with the scenes above them.

Other parts of the building will receive equally

careful attention. The annex will be completely dressed in new material, one feature of which will be the mirrored panels of the posts and walls. The effect of these, as shown by experiment, will be to give the building an appearance of greater size as well as beautifying the surroundings.

Particular attention is to be paid to the decoration of the Armory this season because of the fact that the makers of electric vehicles voluntarily relinquished their claim to space in the larger building in order that all makers of vehicles of that class might be in the same part of the show. They will occupy three-quarters of the center of the main floor and make such an exhibit of electric cars as has never been gathered under one roof. The remainder of the floor will be occupied by gasoline vehicles, as heretofore.

According to late additions the count of exhibitors in the show will be as follows:

Passenger car manufacturers, 102; commercial vehicle builders, 77; accessories manufacturers, 244. Most of the accessory exhibits will remain in place throughout both weeks.

The late acquisition of the Wilson building for show purposes throws a big extra task upon the decorators to get material ready and installed to dress the walls in harmony with the general decorative scheme of the Coliseum and Annex, but the resources are equal to the occasion.

More About Guarantees.

From W. S. G., Massachusetts.—The remarks of "kicker" in the December issue of *The Automobile Dealer and Repairer* seem to me to have a little more than a "grain of sense" in them. While I do not believe in kicking just for the fun of it, still I do think that there are times when a just kick is in order, and may be the means of benefiting somebody else, or of preventing them from making the same blunders you have made, which is only another way of putting it.

The following is my experience with a pair of "guaranteed," treads. Please bear in mind that these treads are widely advertised and guaranteed 5,000 miles without a puncture, etc. I purchased a pair last June and put them onto my Ford runabout. They were delivered with a printed and signed guarantee (on a mileage basis), "to wear 5,000 miles without a puncture, to be free from defects in material and workmanship, and to be exactly as represented in every particular." Also further guaranteed to not heat, rot or injure the tire in any way. I made one run of 125 miles with these treads when one tire went flat. Investigation showed the inner tube to have been completely ruined for a space of six inches by heat and chafing. The tires over which the treads were used were practically new, but when taken off, the rubber covering the fabric was worn through to the fabric at the rims and under many of the rivets, and there was a layer of pulverized rubber nearly a quarter of an inch thick between the treads and the tires which had been chafed from the tires. The tires were practically ruined and gave but little service afterwards. The experience cost me somewhere around \$50. Upon taking the matter up with the manufacturers they advised me that I should have used flaps on my tires to protect the tubes from being pinched, and that if I would get some and put them on and send the bill, together with the bill for the repairs on the inner tube, to them, they would meet the expense. This would have been a matter of three or four dollars. But how about the tires which were

ruined by chafing and heat, which was my principal loss? Since I hardly feel like putting the treads on again for the sake of trying out the idea of the flaps, with the certain result of more chafed tires, I have not used them since. Later letters to the makers have failed to bring a reply or any satisfaction.

I am wondering if there are others of our readers who have had similar experiences? I would also like to know if others have found good results with any kind of treads or tire protectors.

Allow me to say for the benefit of A. B. Roberts, Connecticut, that while I have found some defects in my Ford 1912 Model T as indicated in a previous issue of this magazine, still I am not crying the Ford car down, but am only showing up these defects with the hope that not only other users may be helped, but the makers as well. If I were going to buy another car tomorrow, and could not afford to invest more than a thousand dollars in it, I would buy a Ford and feel that I had saved about \$400 with which to buy gasoline, oil, etc., and perhaps a cigar as a treat to my good judgment. I believe there is no car made which will give as much value for the money as a Ford Model T.

Self-Starters.

Self-starters are always and everywhere a convenience, but in the case of cars that must be stopped and started frequently, they are a positive economy.

We have air starters, spring starters and mechanical starters, but the trend is rather in the direction of electric self-starters, with their added conveniences of electric lighting. Such a starter is clean, economical, convenient and allows restarting immediately if the motor should stall in crowded traffic, which adds to the simple operation of the car.

Insurance experts tell us that the electric self-starter is going to make for fewer accidents with motor cars because it can be operated over the danger point if the gasoline supply fails or if the motor stalls on a railroad track or at any dangerous point.

It makes for economy because the battery upkeep is reduced, as a constant supply of electricity for all purposes is furnished at all times, while economy in gasoline and wear on the engine are advantages of an electric starter which obviate the necessity of running the motor constantly when the car is standing in cold weather.

An ideal starter should revolve the engine fast enough to start on the magneto, should not contain too many parts and be proof against the back kick of the engine. It should be fool proof in every way and so constructed that the novice cannot tinker with its workings.

Above all things, the buyer of a self-starter should deal only with a reputable concern whose guarantee means something and whose record warrants the belief that its product is a success.

For His Model T Ford Car.

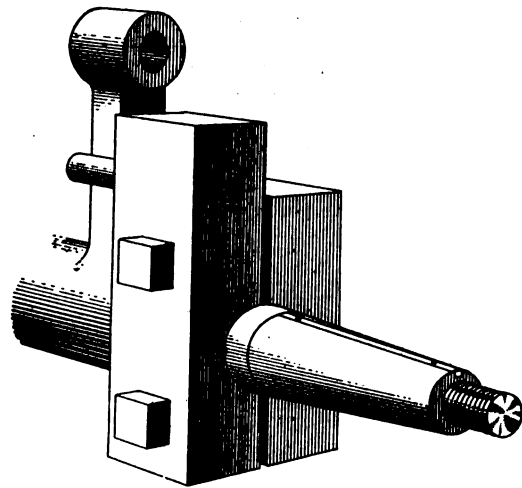
From J. C. Castle, Nebraska.—Tell Dr. James J. Drace of Missouri that if he will put on an air friction carburetor, a K. W. Master Vibrator and a cut-out for hard running with valves tight, and timing correct with his Model T—the king of cars—he can go on high where he has to go on low now. I wish you would tell Dr. Drace to write me.

It is an excellent idea when the lighting system is acetylene and a generator is employed to remove the tubing and displace any water that may have accumulated as the fluid may freeze in cold weather.

Running with a Broken Shaft.

From Donald A. Hampton, New York.—When we got there we found the right rear axle shaft twisted off close to the equalizing gear. It was 12 miles out and some of the way was pretty rough, but we started to tow the car in. After spending an hour on the first mile, stopping every hundred feet to drive the shaft back in the housing, it was decided to try something else.

So the car was jacked up, the shaft removed and a quick run made with the axle back to the garage. While one of the boys was putting a piece of key-stock into the keying on the taper end of the axle, the other one was making a clamp. This clamp is shown in the drawing. It consists of two pieces of 1x1¼-inch steel, joined by two bolts. It is then drilled half in half with a 1¼-inch drill—the size of the axle. A pin, ½ inch in diameter, projects on one side of the



For a Broken Axle Shaft.

long half of the clamp. Armed with the clamp, some grease, and a few feet of stout iron wire, the axle was ready to be taken back to the car.

The axle was replaced but with the clamp on it, the pin resting against the brake support. It could then neither turn nor go further in. To prevent it working out it was wired fast. The tapered end of the axle, upon which the wheel was to turn, was well greased and the wheel was put on as before, except for the nut which was slacked back against the cotter so the wheel was free. Thus fixed, the car was easily towed in and with no further damage. Given a little more time and the clamp should have been made with a V in each piece instead of round. It is then a handy fixture to carry for similar emergencies and will fit varying sizes.

Cause of the Jerky Clutch.

From Martin Swanson, Wisconsin.—I wish to answer No. 1010, from Kenneth F. Beers, Indiana, in the November issue, concerning his 1910 Flanders 20. He says his clutch takes hold with a jerk when going into high and apparently thinks it is in the clutch. But I think, if he will look in his hub in the rear wheels he will find that the hub key seat is broken. This will let the shaft have a little play, which will cause the jerk. I hope this will remedy his trouble.

AUTOMOBILE UPKEEP.

It Depends More Upon the Owner or Driver Than Anything Else.

From C. R. Tinan, South Dakota.—The caption might well be answered with "It all depends on the owner or driver." The modern automobile has reached that degree of perfection that its use for all practical purposes—which means where roads are fairly good a reasonable number of months out of the year—that the layman need no longer fear the bugbear of upkeep. As a matter of fact, automobiles have for the past five or six years been well enough constructed to warrant any man of moderate means owning and operating one. Aside from the initial cost of the machine and interest and depreciation—the latter due principally to the rapid improvements each year over the machines of the previous year—the cost is not as great as the upkeep of a horse and buggy.

Most of the tables of cost of upkeep of automobiles that have come to my notice in the various trade journals have a tendency to frighten the would-be possessor of a machine; and I cannot help but believe that these articles have had a deleterious effect upon prospective purchasers. And yet there is truth in some of them, but only when you hark back to the original saying: "It all depends on the man." The way some machines are handled one would rather incline to the notion that the automobile was indestructible, but the owner of a machine, especially if it happens to be his first one, soon learns the error of that belief. On the other hand, in the hands of a careful driver and with reasonable care such as any fine machinery requires, the life of a machine is a high tribute to its makers.

Let me relate a bit of personal experience. My first machine was a 1906 Reo touring car. This machine was operated almost daily for pleasure driving one full season, or until winter closed in. In the following spring I disposed of it within \$100 of what it originally cost me. During the time I drove it the only expense was for dry cells and spark plugs. I had but one puncture, and three of the tires were never off the machine. The auto was not fitted with a magneto and there was some trouble in keeping up the dry cells, and more in new porcelains for the spark plugs, the latter not at that time being made with the perfection of today—and magnetos were practically unknown. But in spite of this the total cost of repairs (which, as said, was wholly for plugs and cells) did not exceed \$5.00 during the year I owned the machine.

I then bought a Maxwell runabout, a machine at that time listing at about \$850. I drove this machine a year without buying a tire or tube and the only repair was a defective transmission sleeve, which the company replaced free of cost. I had but two punctures with this machine, and the man to whom I sold it ran it the greater part of the following year on the same tires and without a dollar of repairs except to the lamps, which his careless contact with a telephone pole put him up against. It was only necessary to sacrifice the difference between the new price of this model and the old price in disposing of it.

The next purchase was another Reo touring car, also a two-cylinder model. This machine was run one full season without buying a tire or tube or paying out a dollar for repairs, the only expense being for renewing the dry cells and the gasoline and oil.

Then I bought an E-M-F four-cylinder car. This was in the early spring of 1910 and I am still running

it. This car was driven this season about 2,000 miles. Just how much service it had in 1910 and 1911 I have no record of, but the total mileage for the three seasons will approximate between 4,000 and 5,000 miles. Three of the original tires and tubes are still in use on the machine and are in fairly good condition. Through carelessness in permitting cuts on a rear tire to go without repair that tire became full of sand blisters and the rubber tread separated from the fabric, but by lining the tire with an inner lining I was able to get about 500 additional miles out of it, and it was not until late the past fall that a new shoe was put on in place of it. This was the first outer shoe I have ever bought in the six years I have been running automobiles, but due largely to the fact of course that with each machine I got new tires and disposed of them before the tires were badly gone. This last machine has cost me less than \$20 all told for repairs in the three years that it has been run, and all of that due to careless driving—for the best of us will get that way. Both front springs were broken at different times, and a hard bump into a stone in the middle of a hill which doubled up the crank (carelessly left hanging) under the radiator broke the windshield. But though it was necessary to straighten out the crank with a crowbar before the motor could be cranked, after this accident, it went on the first turn. The same spark plugs are on the motor that came with it, and they have never been cleaned but once; the cylinders are free from carbon, the compression as near perfect as can be and no part of the machinery of the car from radiator to rear axle has ever been touched with a wrench. It was necessary once to remove a rear wheel and fit new grease washers—that was all. Eliminating the accident to the windshield the total cost of repairs is confined to wielding the leaves in the front springs—less than \$5.00 all told. This with three years of service.

I have been told that I am unusually lucky with tires. Perhaps so—as far as punctures go. I drove this last machine two years before I got a puncture and the total mishaps of that kind in three seasons is one puncture and one blowout.

Immunity from tire trouble in my own particular case is due largely to letting the brakes alone. In driving on a road that is familiar the practice is to shut off the power and let the machine slow down gradually without using the brakes. The same practice is followed in stopping. The average machine will run a full city block after the power is shut off when running even at moderate speed, and if this practice is followed instead on running full tilt to within twenty-five or fifty feet of the place designed to stop and then applying the brakes hard it will save half the wear on the tires. Slowing up to the limit of the motor when rounding corners will almost save the other half.

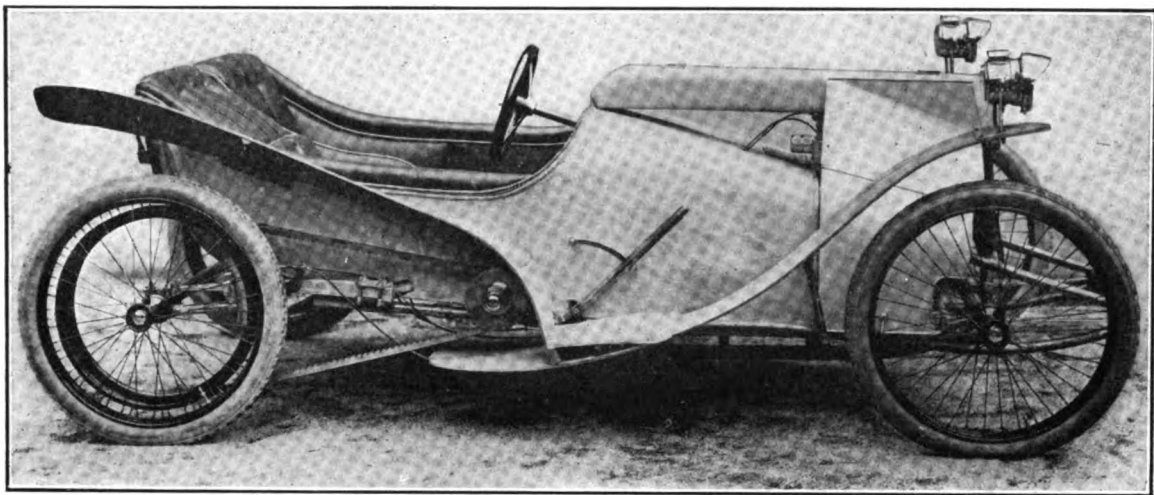
After a run of, say fifty miles, I dose the motor with about a tablespoonful of kerosene in each cylinder while the motor is hot and leave it, giving the crank a few turns by hand to get the kerosene well into the cylinder rings. I have never known what carbon trouble is with any machine, notwithstanding I use a grade of oil that can be bought at wholesale for 26 cents per gallon. After any run of a considerable distance the machine is carefully gone over and cleaned thoroughly, all nuts examined, grease cups either filled or turned down, amount of water in the radiator looked into—the latter frequently flushed out—and the whole machine seen to be in a condition for a road race of a thousand miles if necessary.

A Cyclecar Design.

In the development of the car for persons of comparatively moderate means, a very great development has taken place in Great Britain in the evolution of a car built on essentially cycle lines and hence termed a "cyclecar." Along this line of progress considerable advance will probably yet be made, but one of the foremost designs at the present time, and one which attracted very considerable attention at the recent motor car exhibition at Olympia, London, was the Rudge cyclecar made by Messrs. Rudge Whitworth, Ltd., of Coventry. The illustrations shown herewith give a striking impression of the beautiful lines upon which this car is developed and also demonstrate the many novelties of the design. Apart from the fact that it has four wheels, the construction of this cyclecar is essentially a modification of motor bicycle construction and it is also capable of developing high speeds. The engine is a 5 to 6 h.p. single cylinder

front wheels are splayed at an angle which gives the greatest ease of steering. The tires are Dunlop motor cycle type, the wheel base is 6 feet 9 inches and the width between wheels is 4 feet. The wheels themselves are of a very strong construction and the suspension is by means of elliptic springs. The body is coach built, well upholstered and very comfortable both for the driver and the passenger. Two independent sets of brakes are fitted. A gasoline tank is fitted above the engine and has a capacity of four gallons. A one gallon oil tank is fitted low down in front of the foot board, the pump which is spring controlled, being operated by the foot.

It will be seen that although this car has an engine only about 50 per cent. bigger than the ordinary bicycle engine, it will obtain a speed of 45 miles per hour and has been accelerated up to nearly a mile a minute. It has the good points of wide distance between wheels, low center of gravity and extremely



Comfortable, Powerful and Speedy.

type of 85 m. m. bore and 132 m. m. stroke, its capacity being 750 cubic centimetres. The combustion head is furnished with large fins in order to give ample radiating surface and fly wheels of great weight especially designed are fitted. The chassis is made of weldless steel tubes to which all connections are brazed through lugs. The carburetor is of a specially large type and the ignition is by high tension magneto. The valves are mechanically operated the inlet being of the overhead type with a strong external spring and adjustable tubes. Large openings are given in order to allow a free passage to the volume of gas. The transmission is by means of a 1-inch belt from the engine to the counter shaft and independent $\frac{7}{8}$ -inch belts from the counter shaft to each back wheel. A chain driven hand starter is provided and an expanding pulley on the engine may be opened by an auxiliary lever to remove all belt tension when starting the engine. An expanding pulley and clutch on the counter shaft provides for gear changing while the engine is running but the car is stationary. By the use of double reduction and the use of adjustable side pulleys the gear range is variable through $3\frac{1}{2}$ to 1 on the high speed and 14 to 1 on the low speed. The connecting rod is fitted with roller bearings and the heavy fly wheels allow slow running and absence of vibration of the engine. The valves are superimposed: There is no gearing, no shaft or chain drive and no bevel driven live axle or differential mechanism. The car turns in a circle of 23 feet and the

easy riding properties, and may be taken as one of the foremost types of this comparatively new departure in car design.

Cost of Running an Electric.

Many people who use their electric cars a great deal finds it costs them less than some of their friends who use their machines very much less. Some owners charge their batteries too often. They put their cars on charge when there is sufficient current still in the batteries to give ample mileage for another day's use. This too frequent charging not only adds unnecessarily to the expense of operating, but also shortens the life of the battery needlessly. For these reasons the table of actual expenses below while it is fairly typical, is not in any respect a standard upon which to base an estimate of probable cost in any other case. Some owners could show figures very much lower than these, while others, through lack of attention to the simple details of proper charging, etc., have made their expenses much higher than there is any need of.

The following statement sent in by Mr. More of Sioux City, Iowa, represents the total expense for electric current of a Woods Electric during the past two years:

1911		1912	
January	\$5.48	January	\$2.51
February	1.00	February	3.45
March	1.48	March	2.00
April	3.76	April	3.00

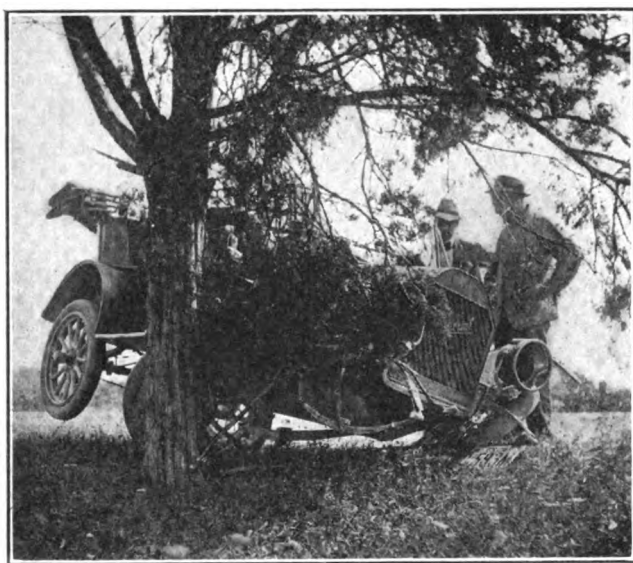
May	7.85	May	2.00
June	8.78	June	3.30
July	7.75	July	4.85
August	6.50	August	3.40
September	3.19	September	3.20
October	8.66	October	4.85
November	4.34	November	2.00
December	3.55		
Total for two years.....\$96.90			

In submitting this statement Mr. More states, in a letter dated Dec. 3, 1912, that Mrs. More uses her Woods Electric on every possible occasion it seems to him, and says further that there was no other expenses for operating the car other than included in the above table.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

It is a significant fact that most of the efforts to secure sane and safe driving of automobiles, and practically all the rational and needful efforts have been



A Result of "Lost Control"

made by automobile owners themselves. Naturally they know best what is required, and it is as much in their interest as in the interest of the public welfare that the highways be made safe for all to use properly. But automobile owners are aware perhaps better than others, that the obligations for securing safe highways must not proceed from one source only. Drivers of horse-drawn vehicles, pedestrians, and all who use the highways have a responsibility, and they must conform to it as well as those who use automobiles. Users of this wonderful new vehicle ask only fair consideration, and the rigid enforcement of all highway laws, whether they concern automobiles or other users of the highways or streets. There is, for illustration, a law in most cities making it a severe penalty for boys to catch at the rear of vehicles for a ride. Owing to the somewhat faster speed of automobiles, boys have neglected horse-drawn vehicles and now cleave mostly to rides on the rear of the horseless vehicle. Yet do we ever see any effort to stop it on the part of the police? Not as far as the observation of the writer extends. This violation of law and dangerous practice may be seen frequently

in all the large cities and the guardians of the peace seem oblivious to it.

Meantime, accidents all over the country from the carelessness of automobile drivers continue unabated. As an object lesson of reckless driving a photograph is reproduced herewith of an accident that occurred not long ago in New Jersey. The car has merely left the highway and come in collision with a tree. Fortunately, no one was killed, but four or five hundred dollars' worth of property was wiped out in an instant. The cause was high speed and the consequent loss of control of the car.

The Steering Gear Breaks.—At Beloit, Wis., a large touring car containing a party of men was thrown into a ditch, owing to the breaking of the steering gear. It was necessary to cut down a small tree into which the auto plunged when it left the road before it could be righted and brought back to where it belonged. All the occupants were more or less bruised and shaken up but none lost his life.

The Car Turned Over.—Near St. Louis, Mo., three men, one of whom will probably die, were injured when an automobile driven at a high speed skidded and turned over while attempting to make a short turn in the road. Three persons were injured and the car was pretty well demolished.

All Happened Within an Hour.—At Fort Worth, Texas, two girls and a boy were hurt and an automobile and motor cycle were smashed by collision which was caused in some way by one or the other not giving half the road. The victims are all alive but it will be a long time before they will be able to attend to business.

On Slippery Rails.—At Wheeling, W. Va., three men were riding in a car when it turned turtle. The driver endeavored to leave the car tracks but the rails were slippery and the wheels refused to grip. It turned to one side with such force that the occupants were spilled out and all received severe injuries.

This Car Skidded.—Near Paris, Ky., a car being driven at a rapid rate skidded and struck a tree at the side of the road and rolled down a 20 foot embankment. It turned over four times and pinned the occupants beneath the wreck. They escaped with their lives but it is feared that one may die and the other is horribly injured.

The Driver's Coat Fell Off.—On the south shore of Long Island a man was driving his car along the road at a good rate of speed when the wind blew his coat from its place on the seat and he reached quickly for it. As he did so he lost control of the machine and it veered to the side of the road and crashed into a tree. Both the man and the automobile were damaged.

Another Grade Crossing Accident.—A railway train dashing along at 40 miles an hour ran into an automobile at a crossing near Stonybrook, Pa., and two men were killed, while the locomotive was badly damaged. Whether the two occupants of the car heard the warnings of the locomotive bell will never be known. The car kept right along to the railway track, however, and escape was, of course, impossible. The crossing has long been considered a dangerous one and it is not the first time that a fatality has occurred there.

Killed Under Automobile Wheels.—A little girl aged nine lost her life in the streets of Milwaukee, Wis., while waiting to take a street car. As she

stepped off the curbing she was met by an automobile which passed over her slender body. She did not regain consciousness and died an hour afterwards. The owner of the automobile claims he was going at a low speed. Possibly this may have been so, but he was not going slow enough to avoid killing the little girl.

Six Hurt and One Arrested.—In Philadelphia while driving a car fifty miles an hour, it met another and the wreckage from the two machines were strewn for yards around the scene. One man was thrown over a fence and five more were very much injured. It was stated that as many as thirty warrants had been out against the driver at one time for driving faster than the law. Unfortunately this driver was the only one who escaped serious injury. The rest are probably surprised to find themselves still alive.

Blown From Under His Car.—In New York City a gasoline tank exploded while the driver was under the car tinkering with it. It appears there had been a backfire from the muffler, and the man crawled under the car with the intention of releasing the gasoline and saving the car from being burned. It was while he was looking under the car in this position that the gasoline exploded. He was seriously injured.

A Collision With a Motor Car.—A young woman and a man were driving in the suburbs of Dayton, Ohio, when the driver attempted to cross the track in advance of an oncoming electric car. The automobile and the car met squarely on the rails. The big machine was carried some distance along the track and when the passengers in the electric car alighted, they found the crushed form of the young woman among the debris. It is stated that the motorman expected the automobile to stop, and the automobile driver expected the electric car to stop. And there you are.

May Lose Sight of One Eye.—Near Sacramento, Cal., one of the wheels of a large touring car broke while going at a fast rate of speed, and the driver was unable to bring it to a stop, or keep in the middle of the road. The machine and occupants plunged through a thorny hedge. There were three young women and three young men in the car besides the driver and at last accounts they were all being attended in the hospital for cuts and bruises. One of the young women will probably lose the sight of an eye.

Car Turns Over on Three Persons.—Near St. Louis, Mo., the driver of a car became excited when he met a dog and ran into a curb. The machine was damaged seriously, but the passengers escaped with their lives, although they were all seriously injured.

Did Not Dodge a Trolley Car.—In Chicago four persons were injured, and two seriously, by being struck by a swiftly moving trolley car. It is stated that the man who drove the automobile was trying to avoid a collision with one car when he ran directly into another. The automobile was wrecked.

Ability and Need.

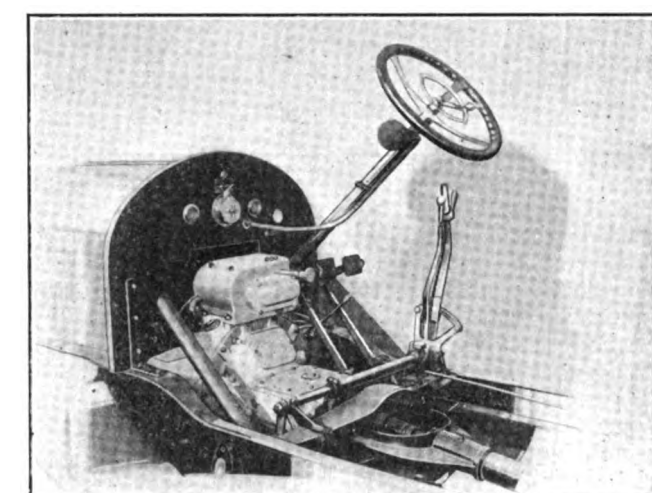
"From each according to his ability, to each according to his need," would seem to be the principle of a Chinese storekeeper whom a traveler tells about. The Chinaman asked \$2.50 for five pounds of tea, while he demanded \$7.50 for ten pounds of the same brand. His business philosophy was expressed in these words of explanation: "More buy, more rich—more rich, more can pay!"

A New Self-Starter.

Each season the automobile shows bring out some new departure upon which the critical eye of the world's engineering genius is focused. This year the Pathfinder 40—made in Indianapolis—comes forward with an innovation in the form of an electrical self-starter which appears to be a unique piece of mechanism. Contrary to the usual arrangement, the self-starter on the Pathfinder is mounted on top of the fly wheel. The motor proper is incased in an aluminum housing, which also contains the reducing mechanism and the switch.

To operate the self-starter it is only necessary to push a pedal extending from the housing, the button of which is located along side the clutch pedal. The advantages of this installation are that the starter with all attached parts can be assembled as a unit outside the chassis and easily attached to the same.

The housing is just where it is needed and no brackets and rods are necessary to transmit the pedal movement to the gears to be engaged. There is nothing to prevent the positive operation of the starter except improper ignition or carburetion. But the engineer has provided against this by making the entire electrical apparatus absolutely independent. This feature of the Pathfinder starter makes it decidedly of interest to the motorist whose troubles originate mostly in faulty ignition or improper carburetion.



Over the Flywheel.

The Motor Car Manufacturing Company has applied for a patent on this self-starter and may manufacture it independently on a large scale. Engineers from all over the country have visited the Indianapolis factory to study the peculiar construction of the new self-starter but the secrets of the application are being carefully guarded by Chief Engineer Karl Fielcke.

Little Grains of Sand.

From C. B. Emerson, Toa Alto, Porto Rico.—This is to offset the item by L. W. Hadley, M.D., Maine, Page 42, November issue:

His trouble is grains of sand, as he does not take the trouble to clean out his shoe thoroughly when he has it off.

Who Can Tell Him?

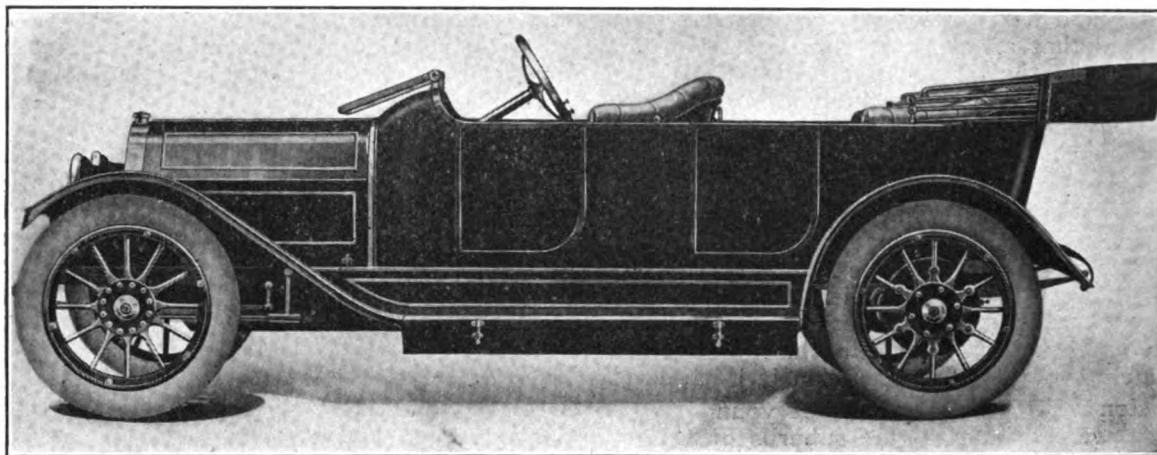
From a Reader, New York.—We will appreciate very much the favor if you will tell us who are manufacturing or selling the Saunders Petroleum Saving Device.

The Mighty Michigan.

The Mighty Michigan touring car, Model R, 40 h.p., is indeed a mighty good car. In fact, we don't see how a better one can really be made, no matter what the price. Not only is it made of the best material and trimming, but it is up to the minute in the improvements that make for the utmost comfort and the highest efficiency. It is made by the Michigan Motor Car Company, of Kalamazoo, Mich., and has four

splash system of oiling is used, the lower part of the crank case holding the reservoir of oil. A plunger pump is driven off a special cam on the cam shaft. The oil is strained in the base before going to the motor, thus barring any deleterious substances or foreign matter.

One of Cameron's triumph is found in the remarkable silence of the Michigan motor. No motor on a car of any price is freer from noise. So smooth and



The Mighty Michigan 40, 1913 Model.

speed transmission, electric lighting, and over size tires. But it has many other improvements, some of them distinct advances from the usual practice in medium priced cars.

Among its other notable features are the left-hand drive and center control, electric lighting throughout by generator system as regular equipment, over-capacity construction and extra roomy body with 14-inch Turkish cushions.

The car is designed by Cameron, who was chief engineer of the Willys-Overland Company for four years. At one period and another of his career, Cameron has been identified with the Marmon, the Oldsmobile, and the Packard. His experience in automobile science, both in this country and Europe, entitles him to rank among the most successful automobile engineers in America.

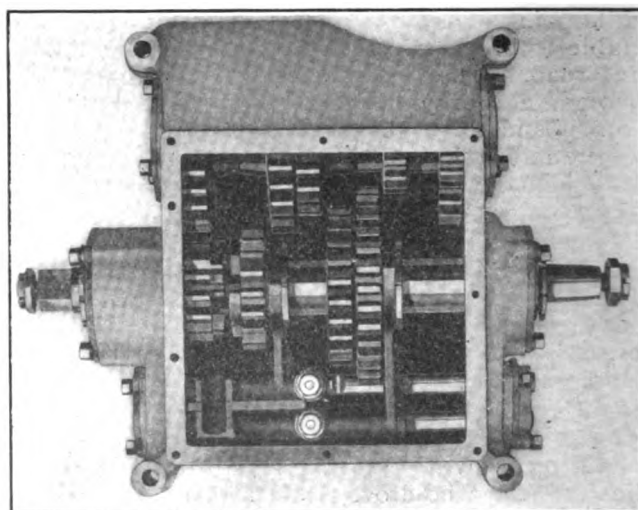
The motor is of the four-cylinder type, cast en bloc. The bore is $4\frac{1}{4}$ inches and stroke $5\frac{1}{4}$ inches. It develops from 40 to 46 h.p.

The cylinder valves are all on the right side. The valves are $1\frac{7}{8}$ inches in the clear, with $3\frac{1}{2}$ per cent. nickel steel heads electrically welded to carbon steel stems. Operation of the valves is by mushroom lifters. The design of the Mighty Michigan motor brings both intake and exhaust manifolds to the right side of the motor. They are so placed that one may be removed without disturbing the other. The special design of the piston eliminates superfluous oiling, and thus prevents smoking. The Michigan motor is practically smokeless.

A three bearing crank shaft of liberal design is used. This shaft is of 45 point carbon steel, heat-treated, with a tensile strength of 90,000 pounds. The three main bearings are of special nickel babbitt. All these bearings are die cast. A wide continuous steel shield guards the fly wheel and prevents the throwing of oil over floor boards. The crank and oil case are of aluminum of a high grade. The utmost rigidity is effected by the construction. The constant-level

silent is the Michigan motor that it is impossible for any one standing three feet away to tell whether it is running or not.

A leather-faced aluminum cone clutch is used. The transmission of the 1913 40 h.p. Mighty Michigan cars embodies four forward speeds and reverse, with the direct drive on the fourth. This transmission is



Cameron's four forward speed transmission, direct drive on fourth.

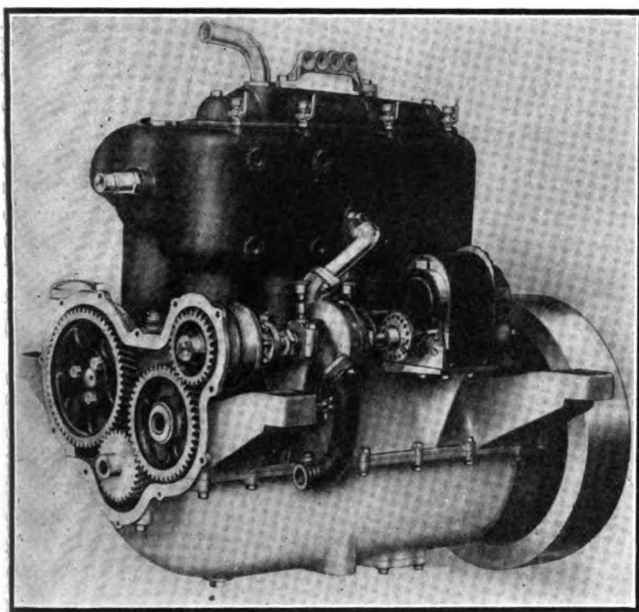
the special design of Cameron, after experience and study among all the leading English, French and American cars. Four-forward-speed transmissions are now found on 157 European makes of cars. With this transmission, having the direct drive on the fourth, a much higher efficiency is obtained from the motor at a much less expense. It also affords a far greater flexibility than is possible to a three-speed transmission, and adds much to the ease and pleasure of riding. It provides an efficient and logical control of the car without wasting fuel and without racing the

motor, consequently with far less vibration. Its advantages are especially noted in grade climbing.

The wheels are of the Shortsville artillery type. There are 12 spokes to each of the wheels, front and rear. Firestone quick detachable universal demountable rims are used. An extra rim is included. The Michigan "40" is equipped with 35x4½ tires. According to the schedule issued by the tire manufacturers, very few cars are equipped with tires of sufficient capacity to carry their weight.

The body is big, roomy, straight-lined, giving the utmost space in front and rear seats. Twenty-two coats of paint are required to get the lasting finish put on the Michigan bodies. The upholstery is soft, high-grade leather, filled with the finest curled hair. The Turkish cushions are 14 inches deep.

The Michigan is a four-door car, that is, it has four doors, each 20 inches wide, in distinction to the practice of three actual doors and a blind door on the



Mighty Michigan Motor.

right side front. The Michigan's four doors enable all the occupants to conform to the traffic regulations now in force in the larger cities, and being adopted by the others forbidding entering or leaving the car on the traffic side. Wheel base, 118 inches.

In addition to the 40 h.p. cars, the manufacturers of the Michigan build a 33 h.p. car, with 114-inch wheel base. Both five-passenger touring and roadster bodies are fitted to the chassis of this car, the touring car being known as Model L, and the roadster as Model O.

Cries of the Dead.

Reporters are obliged to write their descriptions of accidents hastily and often from meager data, and in the attempt to make them vivid they sometimes make them ridiculous; for example, a New York City paper a few days ago, in describing a collision between a train and a motor bus, said: "The train, too, was filled with passengers. Their shrieks mingled with the *cries of the dead* and the dying of the bus!"

In working the high-grade alloy steels it is very important that they be properly heat treated, as poor workmanship in this regard will produce working parts that are no better than ordinary steel, although the stock utilized be of the highest grade procurable.

SOME USEFUL HINTS.

The Matter of Faulty Ignition, Poor Mixture and Bad Valves.

E. K. Barnes in Motor Field.—The performance of the car as a whole depends primarily upon the motor's operation. Its many parts and the many principles involved in its operation require that it be given the bulk of attention.

It is not to be expected that the average motorist will be able to diagnose and treat all the weaknesses to which the motor is subject, but there are regular developments in the general run which may be handled properly and to good advantage with a small amount of application and study on the part of the operator.

The most common disturbance of the motor is the missing of explosions or "missing" as it is commonly termed. Right here common sense is necessary. One of the cylinders develops a miss without warning, and is persistent, at slow speed and at high. The other cylinders fire well and obey the throttle. The secondary wires carrying the current to the plugs are all in place. First locate the missing cylinder. Take your wooden handled screw driver or hammer and with the shank or head ground the wire terminals with the cylinder casting one by one while the motor is running idle slowly. Hold the tool by the wooden handle and keep it away from the metal parts. By this method you cut out one cylinder at a time by short circuiting the plug. When you short any of the active cylinders you will note a reduction of speed in the motor or an additional miss if you have a muffler cutout and open it during the operation. When you short the missing cylinder you will note no change in the action of the motor. The conclusion drawn from this operation is that the spark plug is not firing in the cylinder. Disconnect the wire and remove the plug. The chances are you will find one of several things: The points shorted with carbon or soot, a defective insulating material, such as a cracked porcelain, or an excess of oil accumulated on and around the points. Take the plug apart, clean and replace unless the insulating material is damaged. In this case you will have to install a new plug or a porcelain at least. If the cylinder fires you have learned something and gained a certain amount of confidence. If it does not fire, prove to yourself that it is or is not the plug that is causing the trouble by interchanging it with one of another cylinder. If the cylinder in which you have now placed the supposedly bad plug refuses to fire it is evidence that the plug is bad. Discard it for one that is right until such time as you care to tinker with it. A plug apparently good will oftentimes refuse to work under the compression of the motor. Defective insulation is most always responsible for this condition.

This explanation may seem somewhat elementary and too lengthy, but its object is to convey the idea of applying common sense. You know in this case that only one cylinder was affected and consequently the spark plug being the direct agent of the ignition and inasmuch as the engine was not firing, the plug must be at fault.

The method resorted to oftentimes, by those puzzled for the moment as to the exact cause of certain difficulties is to locate the trouble by the process of elimination. After trying a new and perfect plug without success resort again to the screw driver or disconnect the wire from the plug and start your motor. Bring the terminal of the wire to within one thirty-second of an inch of the cylinder casting and note whether there is an intermittent spark between the cylinder and the wire at as regular intervals as the engine should fire. More than likely

there will not be. This tells you that the plug is not responsible and trouble is farther back. Maybe the wire is broken, maybe its other end is not properly connected at the magneto or coil, maybe the distributor or timer is short circuited. Substitute a new wire if you are not sure of the old one. If you find the trouble to be in the magneto take it to someone who knows, unless you have been there before.

The prevalent fault of amateurs seems to be their inability to get started on the right track. They assume that this ignorance and inexperience forbids their attempting a repair or an adjustment of any kind. While your machine is new and in prime condition is the time to prepare for troubles that may appear. If you do not know the results or indications of a missing cylinder, disconnect one of your spark plug wires, ground it and notice the action of your motor. Then when it happens unlooked for you will be prepared to handle the case without worry.

There are, of course, other causes for missing other than defective plugs. Improper mixture is one of the most probable causes outside of ignition troubles. With this form of disturbance the missing is seldom confined to one cylinder, but is promiscuous and may or may not be regular. Again, it may occur only at certain speeds. You say your carburetor has not been touched. Perhaps not, but there may be a small particle of dirt or other foreign substance lodged in the nozzle which will disarrange things. If by a slight adjustment of the gasoline supply you find no change in conditions you may be sure that this is the cause or else it is not carburetor trouble at all.

A particle of carbon lodging under one of the valves will often cause trouble. This latter condition is usually located easily by trying the compression of all cylinders by cranking and noting whether they are all equal. If one has lost its compression it is natural to suppose that valve trouble exists and the remedy is apparent. A leaky gasket between the intake manifold and cylinder casting will produce similar trouble to that just described, only, the cylinder or cylinders directly supplied by this branch of the manifold will be more directly affected. A carburetor adjustment may remedy the missing in the affected cylinder or cylinders, but may cause the other cylinders to go bad from an improper mixture. If you suspect trouble of this nature, take an oil can and drop a little oil around the edges of the gasket. Should the gasket leak the oil will be rapidly drawn through the leak by the suction of the motor.

The three most prevalent causes of motor trouble are bad ignition, bad mixture and bad valves. Probably these difficulties cover 90 per cent. of the everyday disturbances and in consequence are the first conditions to be investigated. Of the three, the first two occur more frequently, and between these two the honors are about evenly divided, but vary somewhat with the different types of motors.

The question is often asked, "How am I to tell whether the mixture is too rich or too rare?" Generally, with the motor running slowly idle a sudden opening of the throttle will cause a "spitting" or "sneezing" in the carburetor if the mixture is too rare. Under the same operation a rich mixture will cause the motor to slow down or "choke" for several revolutions, after which if it "lives through" the ordeal and does not "die" it will gradually clear itself and speed up. In the latter case the excess of gasoline drawn into the cylinders in the form of an over-rich mixture does not burn rapidly enough to speed the motor up until it has exhausted the over supply first taken in.

Ordinarily the indications of a rare mixture are not noticeable while the car is in motion until it has reached a speed where the demands of the motor for gas exceed the supply offered by the carburetor. Then this same "sneezing" becomes apparent. With the car in motion and the carburetor furnishing too rich a mixture one cannot speed the motor without much missing and choking. If you cannot immediately remedy the trouble, release your clutch and speed up the motor two or three times to clear it of this overcharge. Then engage the clutch. This will most always relieve the condition temporarily. An over rich mixture is most always attended by considerable black smoke coming through the exhaust pipe or muffler. This has a decidedly pungent odor.

Explosions in the muffler most always indicate bad ignition although a rich mixture will sometimes cause this. With magneto ignition when muffler explosions occur, clean the points of the breaker mechanism, provided the plugs are in good condition. This is easily done by inserting a fine thin file between the points, drawing it carefully back and forth. Take care to keep the file in line with the surface of the contacts.

Loss of compression readily indicates bad valves which should be removed and ground to the valve seats with any good abrasive. The use of emery in any form is discouraged as it is attended with more or less danger. It imbeds itself in the valves and valve seats and becomes loosened by the action of the valve and then finds its way to the cylinder walls, causing damage to them and to the piston rings. In addition to this it forms "rings" in the valves and valve seats which injure their surfaces. If, upon removing a valve for grinding it is found to be warped so that it does not seat all around, it should be trued up and surfaced in a lathe. Do not resort to coarse abrasives and excessive grinding. All carbon deposits should be removed from the valve before any attempt is made to grind it, and both the valve surface and seat should be clean and "flat" before grinding.

Frequent applications of cylinder oil to the stems of the intake valves is advisable. Frequent applications of kerosene to the stems of the exhaust valves is desirable, but lubrication is not recommended on account of the direct formation of carbon which causes a tendency to stick.

A recent purchaser of a car found that it ran to his satisfaction except for a very slight click occasioned by the valve lifters. This click was very regular and not objectionable. He was told by some motoring friend that this was easily remedied. This friend volunteered to adjust the valve lifters for him. His kind offer was accepted. The friend proceeded to take up the play between the lifters and the valve stems by means of the adjusting screws provided for this purpose. When the operation was completed it was only possible to pass the thinnest sheet of paper between them when valves were seated. The motor was started slowly and ran for a moment or two. All the click had disappeared. The owner was delighted and figured that he had added another item to his knowledge of the gas motor. The next day he started on a business trip into the country. After proceeding a short distance the motor developed a miss. Soon another cylinder went wrong. Being unable to locate the cause of the trouble the owner turned around and with difficulty arrived home. Having already been delayed he lacked time to attend to the trouble further that day and said nothing of his experience. The next morning he went to his garage, started up his motor, and to his surprise it ran without a click. He proceeded to his place of business, but had gone only a short ways when a recurrence of the day before took place. The

indications were those of an over rich mixture. The motor lacked proper compression in three of its cylinders. The valves were removed. The intakes presented a fine clean surface, but the exhausts were much sooted and gave evidence of poor seating. After grinding, with the motor cold, as is customary, the valves were timed and found to be considerably off from the flywheel markings. After the valves were properly timed the motor performed perfectly and continued to do so.

If your valve lifters click a little it is better to let them click so long as the valves are in time. It is very common practice to keep the lifters too close to the stems, absolutely disregarding the timing. As a consequence when the motor warms up the valve stems expand with the heat and cannot close, owing to the slight additional length occasioned by their longitudinal expansion.

It cannot be too firmly impressed upon the mind of the amateur driver that by the exercise of his common sense he may be able to avoid many of the little disturbances that are bound to confront the user of the motor car. Remember there is a reason for everything and the man who has reasoning power is the man who can successfully operate a motor car. It is a piece of machinery and, as such, is subject to all the weaknesses of its kind, but not to the extent that is talked and made light of by the unbelievers. More intellectual use and less abuse will increase your mileage and lessen your troubles and expense.

An Adjustable Rear Seat.

An adjustable rear seat is a motor car novelty. However easy riding a car may be, the passenger's

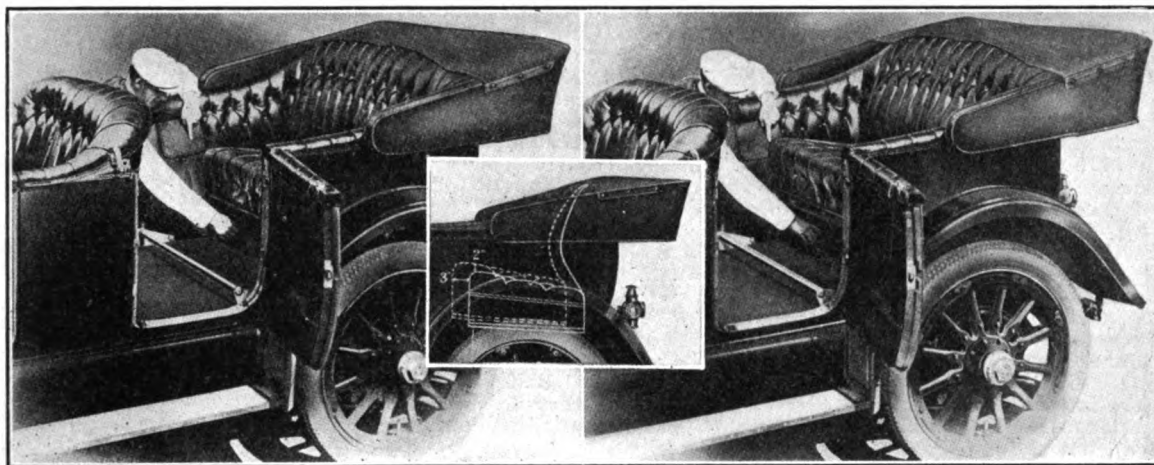
position you liked best? A seat you could make into any kind of a chair, as it were, without even getting up out of it. By just turning a little wheel handle, down out of the way but within arm's reach, it can be raised or lowered two inches or moved forward or backward three inches.

They are a Sight.

The Great White Way of New York City sees nightly during the height of the season, according to an estimate in the *New York Evening Post*, \$50,000,000 worth of limousines. This assumes that there are 10,000 such cars, each costing \$5,000, engaged in transporting their users to theaters, operas, etc. The estimate as to both number and cost of the cars is liberal, but the parade of these limousines certainly constitutes one of the sights of the metropolis.

To Prevent Loss of Plugs.

From L. D. Robinson, Iowa.—Last April we purchased a Stanley Model 73, five-passenger car. We have driven the car about 2,000 miles this summer and have had no trouble at all to speak of. Had to repack the steam throttle twice and had a plug blown out twice during the summer. Both of these troubles were easily overcome, and no grease and oil to contend with in making the repairs. We had the outer ends threaded of the blowout plugs, so we can screw a little bolt into the end of the plugs in case of a blowout. This serves two purposes. It retains the steam so a rear wheel can be jacked up and pump



Back and Low.

Forward and High.

enjoyment depends a great deal on his sitting position. And that is a matter of leg-room and seat angle.

The ordinary type of seat is built with the "average person" in mind. Just who this average person is, few people have ever been able to tell; but it is in the experience of nearly everybody that what fits, or suits, the "average person" won't do so well for ordinary mortals.

In designing their new car the Stevens-Duryea engineers gave special attention to ease. You pick out one particular chair in a room because it "rests your back most," or "fits your legs best," and what could add more to your enjoyment of motoring, when you haven't the same opportunity to "get up and move around," than a seat you could adjust in whatever

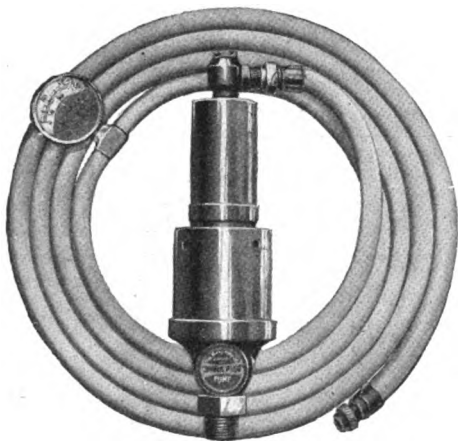
water into the boiler. Then it saves making change of plugs out on the road which saves time and saves pumping water into the boiler by hand, as the fires would have to be turned off and steam all let out before a change of plugs could be made. In replacing plugs the outer end should always be left open, but carry the small bolt with you in case of a blowout. Each time we replace the plugs which should be every two or three weeks we make a little tin spout to slip in under the fusible fitting, then after the plug is removed the throttle end cylinder valve can be opened and water will flow outside of the burner casing and it will flush out all sediment that may collect at inner end of plug, which will save a blowout where there is plenty of water in the boiler.

The Mayo Spark Plug Tire Pump.

This excellent pump here illustrated is a thoroughly reliable power pump which is a handy thing for the tool box of every motorist. This pump may be depended upon in every emergency to give fully efficient service and save time, hard work and your tires.

Now is the time for you to make arrangements to motor in comfort this season.

Anybody can use it with sure results. Simply remove a spark plug from any convenient cylinder and substitute pump (with the hands only) is the ad-



The Mayo Spark Plug Tire Pump.

vantageous method of attaching to all motors. After connecting the hose from the pump to the tire, the motor should be started and run on low throttle from two to four minutes until the tire has been inflated to the pressure desired. A half-inch plumber's valve or pet-cock may be installed permanently in one of the engine cylinders, making it unnecessary to remove a spark plug each time in using. The pump inflates the tire with nothing but pure, fresh air, is noiseless in operation, non-adjustable, requires no attention whatever other than an occasional drop of oil, and works equally well on all sized cars from the smallest Ford to the largest Lozier.

The design makes this pump absolutely indestructible. The pumping piston only operates when motor is run on low throttle and automatically locks when the engine is raced; again operating when the throttle is lowered. An article that is small, light, compact, weighing only two and one-half pounds, which may be carried anywhere—always in working order and ready for use.

The pump is furnished complete and ready for use with bushing to fit any car and 12 feet of hose and connections for \$10.00. A reliable pressure register is furnished extra for \$2.50. The manufacturers offer to allow any motorist to try this pump free on his own car before purchasing—certainly a fair and generous offer. See attractive front cover ad in this issue for full particulars and write to Mayo Manufacturing Company, 59 E. 18th street, Chicago, Ill., and mention this magazine.

Effectively Protects Tires.—In conformity with our accustomed policy of bringing to the attention of our readers the many time- and money-saving processes and devices introduced into the motor car market, we have, from time to time, described in these pages

exterior and interior tire protectors designed to prevent punctures and blow-outs. Not enough interest, however, has been directed to the protection of casings and tubes from the demon, rust, which eats the life out of the rubber and the fabric of the casing and rots the tube until it cracks and "goes flat" without warning. No motor car owner would think for a moment of permitting rust to destroy any part of his motor or the working parts of his car. He religiously keeps oil cups screwed up, oilers full and feeding freely, and even keeps the rust from the brass and nickel parts where rust is harmful only from an appearance standpoint. All tire builders agree that rust is death to rubber, and we all know that the average rim is not waterproof and will, therefore, surely rust if not protected. All rims of new cars are lead painted when they come from the manufacturer, but the paint does not wear, and a good waterproof rubber composition metallic paint must occasionally be applied to rims, tire beads, bolts, lugs and rings. One garage proprietor has estimated that the use of a reliable waterproof rim paint saves him 20 cents per day per car, or \$73 per year. This money is earned simply by devoting a few minutes a season to each car and the small cost of a can of the paint. Why not then employ so simple and inexpensive a method of protecting tires and tubes from rust destruction as is supplied by Anti-Rust Paint, which is owned and controlled by W. T. Dorgan of the Standard Tire Protector Company. See their advertisement on another page of this issue.

Wonderful New Plant at Manville, N. J.—The H. W. Johns-Manville Company of New York City, known throughout the world for their asbestos products, have just completed a new manufacturing plant at Manville, N. J., which is described as the last word in industrial construction. The plant consists of nine buildings, constructed of brick, steel and concrete, absolutely fireproof, with roofs of J-M Asbestos Roofing. This plant is located on a picturesque tract of 320 acres, divided by the Raritan River, in the town formerly known as Findern, N. J., but which name was changed to "Manville." The company has a private railroad system comprising five miles of tracks, connecting directly with the Central Railroad of New Jersey, the Lehigh Valley and the Philadelphia & Reading Railroad, thereby insuring excellent shipping facilities. About 3,000 men will be employed at this new plant, making a total of about 7,000 who are now employed by this very large company.

Money In Auto Tire Repairing.—During the coming year at least \$40,000,000 will be spent by American automobile owners for tire repairs. This estimate is conservative. Blacksmiths should prepare themselves to do a large share of this work. Hundreds of these men who two or three years ago were working for small day wages, now own an independent business.

An investment of fifty dollars will buy the tools and a steam vulcanizer that will cure inner tube repairs and all the minor repairs to casings, which can be made by the ordinary mechanic without special training. Two hundred dollars will fit out a small plant that will repair inner tubes and the most serious casing repairs.

As each one hundred automobiles can

be counted upon to produce \$3500 worth of repair work per year, it will be seen that even a small community can offer good returns to a tire repair shop. The average job will pay 50 per cent. profit. A repair shop employing one man and having not over \$500 invested, will often earn a larger profit than a machine shop with an investment of \$5000 and five mechanics. For full particulars of a tire repair equipment and its cost address the Williams Foundry & Machine Co., Akron, Ohio.

V-Ray Spark Plug.—This plug has many peculiar advantages which are explained very carefully in the full-page advertisement of the V-Ray Company of Marshalltown, Iowa, the manufacturers. No mica or porcelain touches the cylinder's heat. The entire insulation as exposed to the heat of the cylinder is made of an imported Flint-Lava and is practically unbreakable, even when it is thrown onto a stone or tile floor. The electrodes are of the highest grade Herman Boker's genuine meteor wire and will resist the most withering heat without corrosion or fusing. This plug is built, the manufacturers say, for service. The price is \$1.25, but it is said it will last a life time. You do not need any priming devices with the V-Ray Plug. Send your orders direct to the manufacturers at the above address.

Motsinger Magneto.—This device increases the power of any gasoline and is just what every blacksmith needs. With it you can start and run your motor without a battery. Write at once for further particulars and prices to the Motsinger Device and Mfg. Company, 589 Cheery St., Lafayette, Ind.

"Absorbine."—This preparation does not blister or remove the hair, and the horse can be used every day while applying it. It reduces swellings and soft bunches, stops lameness, inflammation and reduces the pain. It is sold at \$2.00 a bottle by druggists generally or you can get a bottle direct from W. F. Young, P. D. F. 55 Temple Street, Springfield, Mass.

For the benefit of our English readers, we desire to say that E. J. Samuel, who has been in charge of the Publicity Department of the Goodyear Tire and Rubber Company, has been promoted and will act now as manager of the Advertisement Department of the Goodyear Tyre & Rubber Company (Great Britain), Ltd. with headquarters at Central House, Kingsway, W. C., corner Kemble street, London, England.

TOOL MAKING.

By EDWARD R. MARKHAM, American Society of Mechanical Engineers, Instructor in Machine Shop Work, Harvard University and Rindge Manual Training School, formerly Superintendent Waltham Watch Tool Co., 225 pp., 325 illus. Cloth binding. The whole subject is here exhaustively treated and profusely illustrated. The information given is of inestimable value to all machine shop men, metal and wood workers, and all whose tasks may occasionally call for the exercise of mechanical skill, ingenuity, and inventiveness in the devising of special means to accomplish special ends. Price.....\$1.50

Sent to any address, postage prepaid, on receipt of price.

M. T. RICHARDSON CO., Publishers,

71-73 MURRAY STREET,

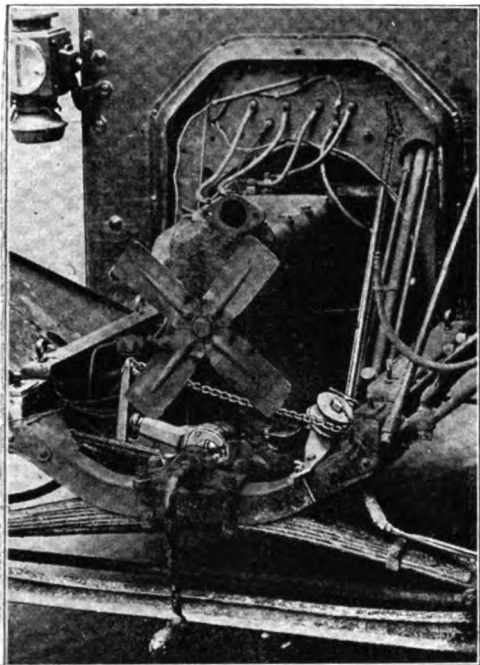
NEW YORK.

Triplex Ford Engine Starter.

Another refining touch has been added to the perfected Ford automobile in the way of an auxiliary crank that allows the driver to start the motor while sitting in the seat, with the same effort as when standing in front of the car. The Bremer-Wilson Manufacturing Company of Chicago is now manufacturing this clever device under the name of the Triplex Ford Engine Starter, and it is greatly appreciated. This auxiliary crank allows two ways of starting the engine as the crank that is now on the

tured. There being 70 to 80 pounds of air pressure against this plastic material and being surrounded in all directions by the two tubes or red sections, when punctured there is no place for this plastic material to go but into the cavity or crevice made by the puncture. The motion of the car rolling over the road helps to put this plastic material into a solid mass almost instantly. With this system you eliminate air trouble and at the same time have all the advantages of any pneumatic tire, as it is easy riding and economy in power in

just brought out the J-M Keystone Radiator Shield, which is designed to be attached over the front surface of the radiator. The Keystone Shield is made in the shape of standard types of radiators. It consists of a thick layer of thoroughly cleansed cattle hair neatly quilted between two layers of water-proofed imitation leather so that it will permanently retain its insulating value. The center of the shield towards the top is arranged as a folding flap, which can be closed by means of two snap hooks, to cover the entire front of the



How the Starter Works.

car is still left on. All that shows is a small nickelplated handle beside the steering wheel post, the auxiliary crank being under the hood between the engine and the fan. It is so constructed that the clutch immediately releases in case of a back kick. A small notch is cut in the top of the top toe board to allow the handle to go through. There is no machine work necessary to attach same and it can be easily attached in about the time it takes to fix a puncture after the radiator has been removed. The price is very low and it will last as long as the car. Address the Bremer-Wilson Manufacturing Company, as above, for full particulars.

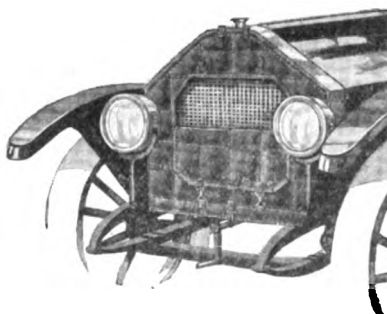
A New Punctureless Inner Tube.

Charles E. Miller, of Anderson, Ind., a veteran expert in rubber and pneumatic tires, has invented a puncture proof inner tube for pneumatic tires which has the merit of being new in conception and which seems likely to fully answer the purpose for which it is designed. A section is illustrated herewith, but it seems as if the artist has made the plastic rubber that is between the two outer layers of cured rubber a trifle thicker in proportion than it exists in the inner tube itself. The plastic rubber layer is sealed up air tight and is surrounded on either side by a complete tube all vulcanized together. It will never dry out, or lose its plastic state, which causes it to work right together again as soon as punc-

propelling the car over the road. The tube contains about four times as much rubber as the ordinary but it ought to be four times better. If any one can give a good reason why this inner tube will not seal up a puncture and at the same time answer all requirements of the best pneumatic tire, we should be glad to have it.

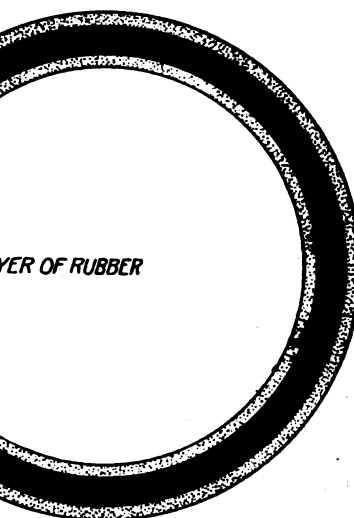
Protecting the Radiator Against Cold.

One of the greatest drawbacks to the use of the automobile during cold



Keystone Radiator Shield, with flap down to permit circulation while car is running.

weather has been the difficulty of keeping the radiator from freezing. The use of blankets or robes to keep the radiator warm is certainly not cleanly, as oil and grease are liable to soil the robes and thus ruin the clothing. With a view of solving this problem the H. W. Johns-Manville Co., New York, have



Seals up a Puncture.

radiator when the car is not running. Opening the flap exposes the upper portion of the radiator, and permits of ample air circulation through the radiator when the engine is running. It will not scorch or burn, and presents a neat appearance. When not in use the shield may be folded and stored under a seat of the car. For full particulars and price address the H. W. Johns-Manville Co., Madison avenue and 41st street, New York.

Agents for the New Fox.—The Fox Typewriter Company, 6601 Front avenue, Grand Rapids, Mich., wants agents everywhere to sell the new Fox Typewriter No. 24, which we can testify is a good machine because we have two or three of them in use in our own office. They have a special proposition to make, but consult their advertisement and write to them at once.

Reo the Fifth.—Our readers intending to buy new cars should by all means consult the full-page advertisement of R. M. Owen & Co., General Sales Agents for Reo Motor Car Company, Lansing, Mich., which will be found on another page. It is one of the best advertisements that has appeared in our columns for a good while. By that we mean that it recites carefully and intelligently points in favor of the Reo car which should appeal to every car user. This advertisement should be read by every reader whether he wants to buy a car or not.

Batteries Exchanged.—Mark W. Heath, 1429 Michigan avenue, Chicago, Ill., has an announcement in this issue of batteries exchanged. Allowance he says will be made to dealers on all old batteries that are kicking around the garage.

The Motor Car Combination Vulcanizer.—This Vulcanizer is for tubes and tires and is claimed by the manufacturers to be the only Vulcanizer made with a gas generating burner. It melts the rubber before vulcanizing it and is said to be entirely different in construction from any other vulcanizer. The price, \$2.00 complete, is certainly sufficiently low to enable every owner of a car to have one. Write for full descriptive circular giving directions for vulcanizing both tubes and tires, to the Motor Car Vulcanizer Company, Indianapolis, Ind.

Reo the Fifth.—Not many of our readers will be likely to skip the full-page announcement in this issue of R. M. Owen & Company. General Sales Agents for the Reo Motor Car Company, Lansing, Mich., in which will be found a very complete description of Reo the Fifth, the 1913 Series, at \$1,095. No one can read this advertisement without being impressed with the good points of the Reo car. The company points out that they have added touches here and there of importance but not visible, which, while they add \$200 to the cost of the car, does not increase the retail price. But read the advertisement. It is certainly worth reading and write at once for their 1913 catalog.

The Motz Tires.—Our readers visiting the Chicago Automobile Show should hunt up the exhibit of the Motz Tire & Rubber Company, Akron, Ohio, and inspect their tires which they say are proof against punctures, blowouts and skidding tendencies. This company is now guaranteeing its tires to run 10,000 miles.

Tirenew.—Tirenew is made by the National Rubber Company, 4440 Papin street, St. Louis, Mo. It is a liquid unvulcanized rubber compound made with a base of pure gum. It waterproofs and protects from oil, moisture, sun and air. It makes tires look like new. See the advertisement of this company on another page.

"Favorite" Clipper Grinder.—This grinder, manufactured by the Heath Foundry & Manufacturing Company, Plymouth, Ohio, grinds the knives of Horse Clipping and Sheep Shearing Machines as well as Hand Horse, Barber and Fetlock Clippers in a few seconds to cut as good as new. About twenty-five turns of the crank will sharpen a set of knives and the holders can be changed in two minutes. Write for price and further particulars.

Cranking Made Easy.—C. L. Hedenberg of Madison, Ga., is manufacturing a device which makes cranking very easy, so he says. His advertisement will be found on another page. Write for further particulars and price list mentioning The Automobile Dealer and Repairer. This device is very easy to attach, we understand.

Square Hole Drill.—Frederick Stolle, 1288 Mission street, San Francisco, Cal., has an announcement in this issue of a square whole drill which he is manufacturing and which will also drill oval, rectangular and halfround holes. He sells the drill and guide at a dollar and sends it postpaid to any part of the

country. Further particulars may be obtained by addressing him as above. In making a drill of this sort, Mr. Stolle has apparently solved a problem which has baffled mechanics from time immemorial.

Auto Repairs Made Safe and Easy.

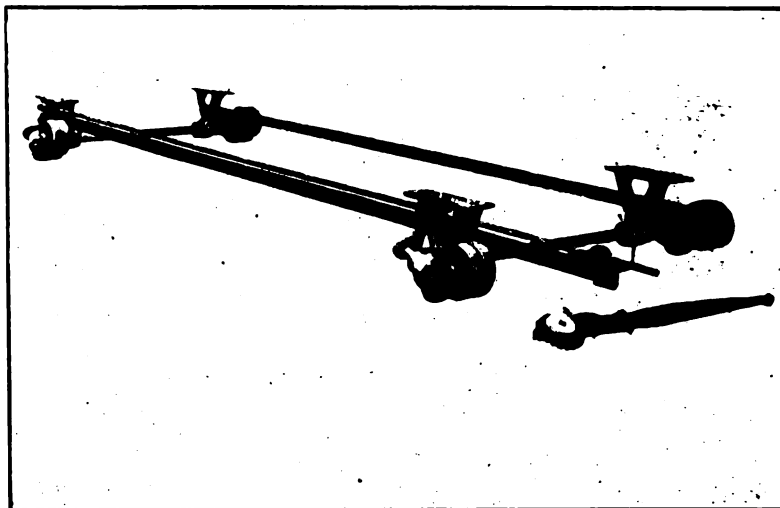
An automobile repair job is never a very pleasant undertaking, under the best of circumstances, and becomes still more disagreeable when only poor preparations can be made.

Tire repairs are the most numerous among all the extra work of keeping the car in good condition for the road,

the need of a lift for cars undergoing tire repairs, washing of wheels and under surfaces and to take the weight off from the tires while the car is not in use. This last, as owners, garage men and manufacturers know, adds much to the life of tires.

This lift lies flat on the floor when not in use. The car is driven in over it and the frame is then lifted by a few turns of the worm shaft, four plates catching the axles of the car without any interference with brace rods or wheel boxes and raising it free from the floor.

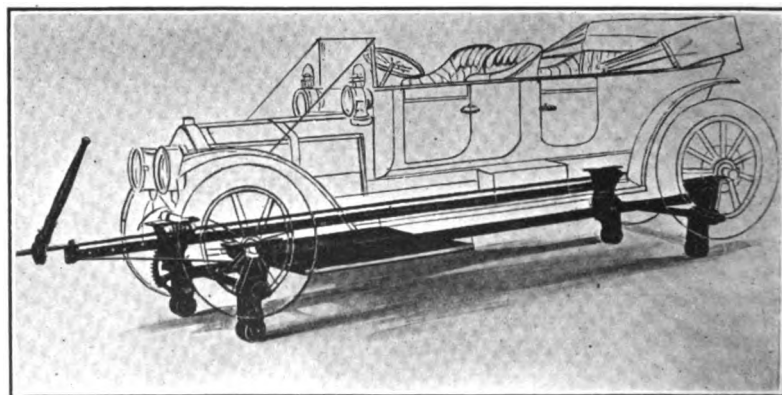
Ball bearing casters permit turning the hoisted car around in a very small



The Burroughs Automobile Lift.

and one of the helps most required in the task, is that of a good lift, truck and turntable. This means one which can be operated easily and quickly and which is absolutely reliable in holding the car rigidly at any point to which it is lifted, until the repair job is finished.

Those who have had many tire repairs floor space or moving it from one point to another in the garage. This lift is fully protected by patents and is put out at a very reasonable cost compared with the other old-style jacks and turntables.



The Lift Attached.

The lift and truck put out by The Burroughs Lift and Truck Company, Racine, Wisconsin, is claimed to possess all the essentials of a lift of this character. In addition, it has the feature of being out of the way when not in use, as it lies upon the floor of the garage allowing the car to be driven in over it.

The Burroughs Lift consists of a light strong frame carrying two axles which are separated by four short legs. It is claimed to be exceedingly simple, strong and efficient. It was designed to supply

(and those who have not) are finding this lift and truck, a combination which fills all the requirements of such a device without the usual disadvantages. The car is held solid and rigid, and tires or wheels can be removed without any fear of tipping, shifting or dropping. It takes up practically no room in the garage and is always ready for use. A few simple easy turns of the lifting shaft, raises the entire car bodily with the single operation. It fills a place and need long wanted in the motor or garage equipment.

LET YOUR ENGINE PUMP UP YOUR TIRES!

A "National" Power Pump will save you many tired backs, also dollars for new tires.

Isn't it true that you often look at your tires and say, "Guess they need more air, but I haven't time, or don't feel like blowing them up by hand—I will let them go for a few days yet." You also know, and every tire manufacturer will tell you, that you pay dearly by neglecting this work. Now, if you had a "National" Power Pump, your tires would always be fully inflated. All you have to do is take off a spark plug, attach the pump instantly, and start the engine. That's the extent of the work. But best of all, your tires will be filled with **absolutely pure, fresh air**, if you use a "National." Not a particle of cylinder gas goes through our pump. "It is made to wear and pump fresh air." We have spared no expense to make it the very best in every possible way. Patented "Leak-proof" metal piston rings are used. Every valve is carefully ground separately. Special connections to make it easy to attach. The entire outfit is highly polished and nickel plated. Twelve feet of woven cover tubing are furnished, in the center of which is a high-grade pressure gauge which shows the exact pressure all the time. In ordering state whether you desire connection to have half-inch standard, A. L. A. M. or Metric thread. Sold on trial. Write for information. Price complete, \$15.00.

VULCANIZERS

WE MANUFACTURE THE MOST COMPLETE LINE ON EARTH. We have them from \$3.50 up to \$40. Get our prices and special offer on sales. Be sure to state whether you want one for your own personal use or for public garage.

THE NATIONAL MOTOR SUPPLY CO.,
1920 EUCLID AVENUE, CLEVELAND, OHIO

We Will Exhibit at the Coliseum, Chicago, Auto Show

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Forty Million Dollars for Auto Tire Repairs.—During the coming year, at least \$40,000,000 will be spent by American automobile owners for tire repairs. This estimate is conservative and is based as follows: At present, 900,000 automobiles are in use; 600,000 will be built for 1913, probably 200,000 of the machines now in use will be scrapped, leaving 1,300,000 to wear out tires. Tire makers say that each machine consumes an average of six outer casings and nine inner tubes per year. Cut this to five casings and seven inner tubes and 6,500,000 casings and 9,100,000 inner tubes will be used next year. At least \$5 per casing and \$1 per inner tube will be spent for repairs and this foots up to the neat little sum of \$41,600,000. Tire upkeep is conceded to be the heaviest item of motor vehicle operating expense. Good tires cost money and the best of them are often out of commission on account of blow-outs, due to under inflation, rim cutting, punctured and the many severe strains caused by carrying loads at high speeds over our rough American roads.

Fortunately, the motorist can have these damaged tires repaired so as to give much additional mileage at a low cost, and the business of tire repairing has grown to one of importance. An investment of fifty dollars will buy the tools and a steam vulcanizer, that will cure inner tube repairs and all the minor repairs to casings, which can be made by the ordinary mechanic without special training. Two hundred dollars will fit out a small plant that will repair inner tubes and the most serious casing repairs.

Many garages, auto repair stations and general repair shops are making money out of tire repairing as a side line. Of course where there are many automobiles, there are independent repair shops doing a large business in nothing but tire repairs. The Williams Foundry & Machine Company, Akron, O., will supply full information about tire repair and vulcanizing to all who will address them and mention this magazine.

Neverslip Tread Tires.—Buttons, knobs or ridges arranged to make a pleasing design as a non-skidding feature, no doubt have been brought very sharply to your notice on wet asphalt pavements, when you were compelled to resort to inconvenient chains. Falls tires are provided with an extra heavy tread, but not of the raised tread type. The series of triangular cups sunk in tread, pocket air, creating adhering qualities not prevalent in other makes of tires, as Falls Neverslip possesses a combination of both non-skid and suction, and can't slip. Manufactured by The Falls Rubber Company, Cuyahoga Falls, O.

The Essex Blowout Patch.—We have received by mail from the Essex Rubber Company of Trenton, N. J., a sample of their Style "C" Inside Blowout Patch, and we believe this article will recommend itself to every user of automobile tires. It is a heavy, strong stiff patch that makes a perfect bridge under a blowout. In its construction seven plies of heavy duck are used, biased to prevent flaps from tearing off. It is made in six sizes to fit any style of tire and the manufacturers guarantee that this patch will not creep. For further particulars concerning it and a large number of other tire specialties readers should write for their catalogue to the Essex Rubber Company, Inc., Trenton,

N. J. To insure prompt attention mention this magazine.

Reduction in Price.—The Joseph Dixon Crucible Company of Jersey City, N. J., makes the interesting announcement that the selling price of their Silica-Graphite paint is reduced. They say they make this reduction because of the decrease in the price of linseed oil which is used as the vehicle in this particular paint. This paint is a well-known product which has been the standard for nearly fifty years with leading railroads and manufacturing plants, as a maintenance paint, and it is guaranteed as a perfect, long-service protector of all exposed steel and metal surfaces.

Needed in Every Garage.

The handy trouble inspection and garage lamp here shown should be in every garage, whether public or private. It can be used in any position, under the



Trouble, Inspection and Garage Lamp, Style 31. Manufactured by Frank W. Morse, Boston, Mass.

car, or anywhere around the car. A long connection wire and plug is provided and this lamp can be connected with the regular lighting system in a moment. It comes packed in a neat plush case, as shown in the accompanying cut, and this case can be slipped easily into a small coat pocket, or even a vest pocket. This lamp is known as style No. 31 and it is manufactured by Frank W. Morse, Boston, Mass. Dealers or car owners who are interested should communicate direct with the manufacturers and mention this journal.

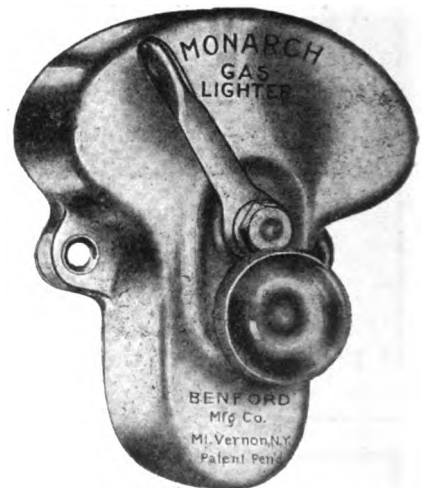
Liquid Tire Tonic.—This preparation is said to maintain equal air pressure, which means no rim cuts, no flat tires. The manufacturers state that it also means 30 per cent. more tire mileage, 75 per cent. less tire troubles. But consult the advertisement in this issue and wire for catalogue entitled "Tire Information" to the Liquid Tire Tonic Company, Kansas City, Mo., and mention this publication.

Mondex-Helix Mixer.—This is a device to be attached to the carburetor of any car, and its object is to render combustion more perfect. The manufacturers claim that it will effect a saving of 25 per cent. in fuel, besides great-

ly increasing the power of the motor, but readers should consult the full-page announcement which appears elsewhere in this issue, and write for further particulars to The Aristos Company, 244 West 54th street, New York City. To insure prompt reply, this magazine should be mentioned.

The New Monarch Lighter.

This device as here illustrated, is made by the Benford Manufacturing Company of Mt. Vernon, N. Y., and their guarantee of its being the best lighter on the market regardless of price should receive serious consideration owing to the other reliable products that this firm turns out. They have been manufacturing the Monarch line of spark plugs and timers for the past ten years and their history of their early start will be sent you upon receipt of request for their booklet of ignition specialties and it should be interesting reading to any automobile owner. The story runs regarding their start of 100 plugs per week ten years ago to their present capacity of 5,000 plugs per day. Attention is also called to their special magneto plug, owing to the success it has met with, which they are still offering at their special price. This special inducement will only run for a very short period. A new plug this firm is putting out is their "Peerless" plug with a list price of 50 cents. There is a guarantee also on this plug and should one positively prefer a porcelain plug, the "Peerless" should have a trial. The Monarch special motorcycle plug should be stocked by any one handling automobile supplies as a very large per cent. of the motorcycle manufacturers are using them for equipment. Attention



The Monarch Lighter. Manufactured by E. M. Benford, Mt. Vernon, N. Y.

is also called to their new oil gauge for Model T Ford cars which is being manufactured by the Benford Manufacturing Company for 50 cents each and their special offer of four Peerless plugs and one oil gauge to Ford owners for \$2. A new addition, tripling the floor space, is now being added to the present building of the Benford Manufacturing Company and from January 15 their production will run on an average of 4,000 to 5,000 plugs per day.

Any owner of an automobile, having use for lighters, spark plugs, timers or oil gauges, are assured by us that the Benford Manufacturing Company only make the best.

"BETTER BE SAFE THAN SORRY"

Wise GUYS miss the best of everything in life and wonder why. To show you is all we ask.

Maintains equal air pressure, which means no rim-cuts, no flat tires, 30% more tire mileage, 75% less tire trouble.



Saves weight, gasoline, trouble, time, money, and increases tire and car efficiency, and pleasure.

TIRE TONIC STOPS LEAKS LIKE YOU WOULD CORK A BOTTLE.

Vulcanizing injures tubes and costs money, causes delays and other trouble.

Have your tires treated with Liquid Tire Tonic and worry no more. *Tire Tonic costs little and saves much.*

Write for booklet "Tire Information," and nearest dealer, or agency proposition.

LIQUID TIRE TONIC COMPANY

G. L. Schofield, Gen. Mgr.

KANSAS CITY, MO.

J. & B. Master Vibrator } For Ford Light Controller } Cars Light Regulator }

Our products have made a reputation for us by our perpetual guarantee:

"Satisfaction or Money Refunded"

J. & B. MFG. SALES CO.

Mfrs. of Ignition Specialties

1777 BROADWAY - NEW YORK

Send for Descriptive Catalogue

HOTEL GRISWOLD

Corner of Grand River Ave. and Griswold St., Detroit, Mich.

Fred Postal
President

Postal Hotel Co.

Chas. Postal
Secretary

Detroit's Most Popular Hotel

European Plan Only

Rates \$1.50 Per Day and Up

The Finest Cafe West of New York

Service A La Carte at Popular Prices

A strictly modern and up-to-date Hotel. Centrally located in the very heart of the city. "Where Life is Worth Living"

Nothing Better at Our Rates

Mosler Fire Spit Fire Plugs are the BEST

SPIT-FIRE PLUGS SHOOT A FLAME

SPIT-FIRE PLUGS HAVE A DEEP CHAMBER

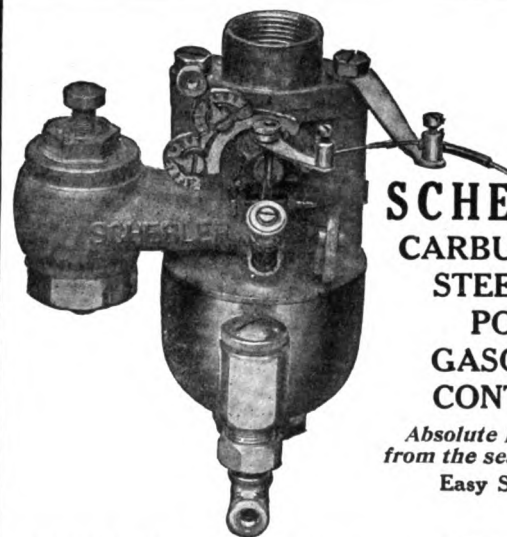
SPIT-FIRE PLUGS USE A PETTYCOAT PORCELAIN

SPIT-FIRE PLUGS WITH PLATINUM POINTS LAST LONGEST

USE GENUINE SPIT-FIRE PLUGS IF YOU EXPECT THE BEST RESULTS FROM YOUR MOTOR

A. R. MOSLER & CO.

P. O. BOX "M" MT. VERNON, N.Y.



SCHEBLER CARBURETOR STEERING POST GASOLINE CONTROL

Absolute Fuel Control from the seat.
Easy Starting.

ECONOMY-SIMPLICITY

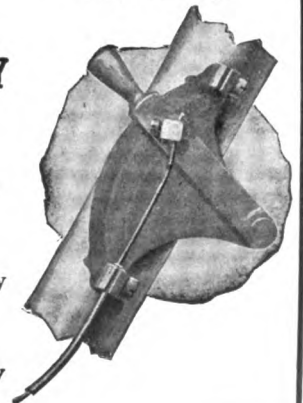
Let us explain more fully.
Write for Circular.

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New Time and Tool Saver.—Nearly every garage is blest with a lot of edged tools that somehow or other keep getting dull. Unless your men are a lot different from the ordinary run they will try to work with dull tools when they ought to stop and sharpen them up. Within the last three or four years there has appeared on the market a new, fast-cutting abrasive that is as hard as the diamond itself. It is made in huge electrical furnaces in Niagara Falls where by means of the electric current produced there the tremendous heat of 7,000 degrees Fahrenheit is easily developed. It is this tremendous heat, the heat in which worlds were formed and which is so intense that it melts or vaporizes every known substance, that gives to Dimo-Grit its unequalled hardness. On account of its being so hard it never glazes or dulls. Every little crystal on the wheel keeps sharp and cuts away the steel in minute shavings. Not only does Dimo-Grit cut 25 times faster than a grindstone but it does it without any danger of drawing temper and in addition leaves a very smooth cutting edge. This Dimo-Grit wheel is mounted on a steel, foot power frame equipped with shaft drive, and beveled gears. It is manufactured by the Luther Grinder Manufacturing Company, Stroh Building, Milwaukee, Wis., who will agree to send this out on 30 days' trial to any garage man that wants to try it out in his own way on his own tools and in his own shop. If he doesn't find it worth a whole lot more than what it costs he is at liberty to return it any time within 30 days. In addition to its tool grinding qualities this machine can be equipped with 30 special attachments such as a lathe, drill, circle saw, forge and other attachments that are needed in every shop.

Demonstrating the Prest-O-Starter.—The Prest-O-Lite Company is now engaged in giving a novel public demonstration of the Prest-O-Starter at its service stations, of which there is one in nearly every large city in the United States and Canada. In these exhibits, the starter is attached to the visitor's engine, and he is shown exactly how it works on his own car. An ingenious device, permits this installation with no defacement of the dash or engine. The demonstrating stand consists of a wooden frame, the upper half to represent the dash of the car, holding the starter pump, etc., and the lower part serving to hold the Prest-O-Lite tanks and Automatic Reducing Valve in place. In a demonstration the stand is placed beside the front fender of the car and connected to the cylinders by means of flexible brass tubing leading to injectors which are quickly inserted in the priming cup openings. If priming cups are absent, then special combination "spark plug-injectors" are used, inserted in the spark plug openings. The gas comes from the tank attached to the lower part of the stand and is forced into the cylinders by means of the Starter pump. The Starter is then ready to use, just as if it were permanently fixed to the car. The whole demonstration takes less than fifteen minutes. The company has also issued literature telling the user how to correct an improper installation, or have a garage do so. In addition to the Prest-O-Starter demonstrator every service station of the Prest-O-Lite Company has a stand for the demonstration of the Prest-O-Liter. By means of this, the visitor is

enabled to see how his gas lamps can be easily lit, dimmed or extinguished from the driver's seat.

Prest-O-Lite for Horse Drawn Vehicles.—Dealers in automobile accessories will find a new and considerable trade in the new use of Prest-O-Lite on buggies and carriages. Several carriage manufacturers have lately adopted Prest-O-Lite for their vehicles, selecting for their purpose the style of Prest-O-Lite now carried on motorcycles. Several others are considering its use, and the excellent light to be afforded at slight expense is attracting many owners. The same universal exchange service available to automobile owners may be enjoyed by buggy and carriage drivers. It is a good opportunity for new business for dealers who handle Prest-O-Lite and exchanges, for in many sections of the country horse-drawn vehicle outnumber the automobiles.

Many State laws and city ordinances requiring better lights for buggies have been enacted since the advent of the motor car. An unlighted buggy, turning from a dark side street into the path of an automobile, is hard to see and many disastrous accidents have come about in just this way. And collisions between two horse-drawn vehicles in the dark are not infrequent. Special literature on carriage lighting may be had from The Prest-O-Lite Company. Mention this journal.

Mahin News Service.—Dr. C. E. Welch, president of The Welch Grape Juice Company, Westfield, N. Y., is an enthusiastic automobilist and a great booster for both Goodrich and Diamond Tires. He is sending out the following 1913 Greeting to his friends:—

"That your tour, in that new 1913 model, may be the most successful of your life; that your spark may never fail; that the steering gear may not go wrong;

that your differential may negotiate the turns and angles; that your only blow outs may be jolly ones;

that you may take the grades as sweetly as you do the levels; that your brakes, efficient, may save you in every emergency, and that you may turn into the garage at the end of the year with a record to be proud of; is my New Year's wish for you."

The Mayo Spark Plug Pump.—The Mayo Manufacturing Company has begun suit against firms which it is alleged are infringing their patent. The firm says: "Not only do we warn dealers that we propose to protect our pump and jobbers handling it, but we court a thorough investigation for the protection of your own interests and the avoidance of legal actions."

National Power Pump.—The National Motor Supply Company of Cleveland, O., exhibit at the shows an improved spark plug tire pump. That the pump has been designed by an experienced tire and rubber man is shown in the fact that pure air only is pumped into the tire. No injurious gases and products of combustion are permitted to enter the inner tube. The pump consists of a very substantial outer cylinder divided into two main compartments within which a piston reciprocates, receiving an impulse at each stroke of the engine piston. The pump is put into service by removing a spark plug and

screwing the pump into the plug orifice. On the downward stroke of the engine piston pure air is drawn into the upper chamber, the outlet valve being closed. As the engine piston starts downward the inlet valve closes and the outlet valve opens permitting air to pass into an auxiliary chamber from which it then passes into the tube leading to the tire.

This auxiliary chamber acts as an equalizer and permits the current of air to flow steadily into the tire. A pressure gauge placed in the tube leading to the tire, records the pressure, the gauge needle holding steady and permitting an accurate reading by reason of the equalizing effect of the auxiliary chamber. The entire pump is nicely polished and nickelplated.

Squegee is a New Word.—The tendency of the man in the street to select his own name for a thing which the maker wanted to call something else, has compelled The Diamond Rubber Company, of Akron, to incorporate the unusual word "Squegee" as part of the name of its Safety Tread Tire. When this tire was introduced about a year ago, some of the company's advertising stated that the tire worked like a squegee. Immediately people all over the country began to ask dealers for the "Squegee Tire." There were so many of these perverse individuals that the tire makers though still believing their own name, "Safety Tread" a far better name, decided to meet the other opinion halfway by incorporating the word "Squegee" in the original name. This is so far as is known, the only tire which the public has had a part in naming.

Peerless Perspireless Pump.—Our readers who have attempted to pump up tires with the ordinary tire pump and found themselves dripping with perspiration will be interested in the Peerless Perspireless pump, illustrated and described in this issue, by the Peerless Accessories Manufacturers, 1956 Wabash avenue, Chicago, Ill. Inflating tires with the Peerless Perspireless Pump is boy's work as compared with doing the work in the old-fashioned way. But write to the manufacturers for further particulars and prices or ask your dealer for this pump.

The Motz Tire and Rubber Company of Akron, Ohio, has just opened a branch in St. Louis, Mo., 4436 Olive street. The new branch will be in charge of E. G. Seibel, and will be equipped to give complete service to all users of Motz Double notched tread cushion tires.

Firestone Accessories.—The Firestone Tire & Rubber Company of Akron, Ohio, have a full-page announcement in this issue descriptive of some of their accessories such as the "Inside Patch," "Cure Cut," "Lace-on Boots," "Cementless Patches," etc. Write for accessory catalogue giving full particulars and price of the different devices which this company manufactures. This catalogue contains full details with illustrations which should be in the hands of every owner of a car.

Handy Van Steam Vulcanizers.—These are manufactured by the Vanderpool Tire & Rubber Company, of Springfield, Ohio, and are designed especially for automobile owners and garages. The device will be found illustrated and described in our advertising department. A catalogue giving full details will be sent to every reader writing for it.



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can make of car and most of the leading foreign makes.

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In the meantime, if you should want further information on the subject, write us. We will send you a descriptive booklet and prices.

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Auxiliary Cold Weather Starter.—The Hagstrom Bros. Manufacturing Company of Lindsborg, Kansas, manufacture the Hagstrom Suction Primer or the Auxiliary Cold Weather Starter, which vaporizes the fuel like a carburetor, and starts your engine in zero weather on the first turn of the motor. They are making a special introductory offer now. But consult the advertisement of the company on another page.

The Apco Anti-Rattling Ball Socket.—The Auto Parts Company of Providence, R. I., have an announcement in this issue in the nature of a warning to the trade with respect to the Apco Anti-Rattling Ball Socket for the front axle radius rod of the Ford Car which they say is covered by a patent granted November 12, 1912, and they have the sole and exclusive right to manufacture use and sell same. They will prosecute

any infringements. But write to the company as above for further particulars.

Electro-Knickel Powder.—This preparation is manufactured by the Gun Metal Finish Company, 314 Powers Building, Decatur, Ill. It is applied with a cloth and will deposit a coat of metal or brass, nickel steel or iron without a battery. It is not a mercury or silver wash. The manufacturers guarantee that it plates. Consult the advertisement of this company on another page and write to them for further particulars.

The Gearless Transmission.—The Cartercar Company of Pontiac, Mich., have a full-page announcement in this issue directing particular attention to the gearless transmission which is the leading feature of their car. They say this kind of transmission gives greater efficiency and greater tire mileage. They have four models for 1913 ranging in prices from \$1,600 to \$2,000 including equipment, and they shall exhibit at all of the big shows. The Cartercar has come to the front with considerable rapidity for the past two years.

Wonder Disc Sharpener.—A. E. Durner, of Evansville, Wis., makes the Wonder Disc Sharpener which will be found illustrated and described in our advertising department. He makes the Little Wonder Disc Sharpener and the Giant Disc Sharpener. Dealers in blacksmiths' supplies generally are supposed to keep both of these disc sharpeners. But consult the advertisement for further particulars and either write direct or ask your dealer.



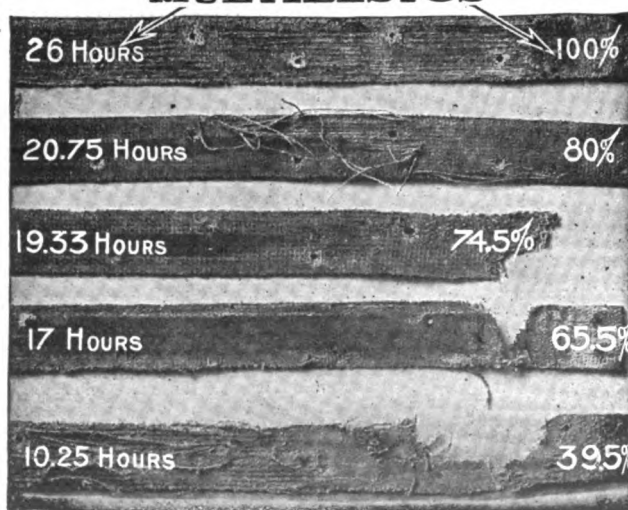
Plain Gas Engine Sense

By E. L. OSBORNE

Price 50 cents, postage prepaid to any part of the country. This little manual gives a great deal of interesting and valuable information with respect to running gas or gasoline engines. Every owner of an engine should have one of these books. Address all orders to

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71-73 MURRAY STREET, NEW YORK

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MULTIBESTOS

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THE REAL INSURANCE AND PROTECTION

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DETROIT, 1598 Woodward Avenue
CHICAGO, 1430 Michigan Avenue
SAN FRANCISCO, Fred Ward & Son

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Tire Accessories.—Many of our readers are purchasers of various kinds of tire accessories, including blowout patches, reliners, and other articles of a similar nature, and in an advertisement which appears for the first time this month from the Mattson Rubber Company, Lodi, N. J., they urge our readers to communicate with them regarding all products of this description. They make the point that it is often advantageous to buy direct from bona fide manufacturers. These people manufacture a complete line of tire repair stock and supplies. They also do mixing and calendering for the trade, and a specialty is made of all kinds of mould work. Jobbers are especially urged to write at once for quotations. In all correspondence mention this magazine.

Edwards Fireproof Steel Garage.—For the next 30 days the Edwards Manufacturing Company, 723-773 Eggleston avenue, Cincinnati, Ohio, offer one of its "Steelcote" Garages 1913 Model, direct from the factory for \$92.50. It is an artistic steel fireproof structure for private use. Gives absolute protection from sneak thieves, joy riders, fire, lightning, accidents, carelessness, etc. But consult the advertisement of this company on another page for further particulars and write for its 56-page illustrated garage book, which will be sent by return mail.

The New York Coil Company, 338 Pearl street, New York City, have just added a new type Master Vibrator to their already well known line, known as Model T. The feature of this instrument is the two adjustments whereby the perfect operation of any four-cylinder coil is assured as an adjustment may be made which will operate when the magneto is delivering its minimum amount of current such as is the case when starting or when the magneto becomes weakened from use. The Rhoades Battery Ignition System, as put out by this concern for the past three years shows a number of improvements for 1913, among which are a small condenser in the instrument itself as well as the coil insuring total absence of spark at the contact points, materially adding to the life of same and rendering adjustment unnecessary more than once or twice in a season's use. A new type of terminals and distributor block is also used. Due to improved facilities for the manufacture of this device, the prices have been reduced. Interesting and instructive literature free to all subscribers of The Automobile Dealer and Repairer.

Edelmann Economy Gauge Enjoined Twitchell Patent Again Sustained Injunction issued in favor of A. Schrader's Son, Inc.

Notice is hereby given to the trade that:

In a suit brought by A. Schrader's Son, Inc., of New York, against E. Edelmann & Co., of Chicago, for infringement of Twitchell patent No. 927,298, Judge Humphreys, of the U. S. District Court of Illinois, issued on December 18, 1912, a preliminary injunction restraining E. Edelmann & Co. from the manufacture, sale and use of the Edelmann Economy Gauge.

This injunction, which was granted despite vigorous opposition by E. Edelmann & Co., is the last of an unbroken series of victories for the Twitchell patent, now the sole property of A. Schrader's Son, Inc.

The decision of the Illinois court sustains the contention of the owners of the Twitchell patent that this patent covers all "pencil type" gauges now upon the market.

The following gauges have been held to be infringements of the Twitchell patent:

The Northam Gauge—held to be an infringement by the U. S. Circuit Court of the Southern District of California in the suit of Chas. R. Twitchell vs. Northam Auto Pressure Gauge Co.

The Prest-O-Lite Gauge—held to be an infringement in the suit of Chas. R. Twitchell vs. Prest-O-Lite Co. in the Southern District of New York.

The Safety Tire Gauge—held to be an infringement by the Supreme Court of the District of Columbia in the suit of Chas. R. Twitchell vs. Rudolph & West Co.

Furthermore, in the suit against the New York Sporting Goods Co., the sale of the Edelmann Economy Gauge was enjoined.

All other infringers will be promptly prosecuted.

The only gauges authorized under the

Twitchell patent are the Schrader Universal Tire Pressure Gauge, the Twitchell Tire Pressure Gauge and the Allen Tyrometer.

The trade is warned that the sale or use of the Edelmann Economy Gauge, or of other infringing gauges is as much an infringement of the Twitchell patent as the manufacture of

the gauges themselves.

Consequently, jobbers and dealers handling infringing gauges are liable to injunction and damages.

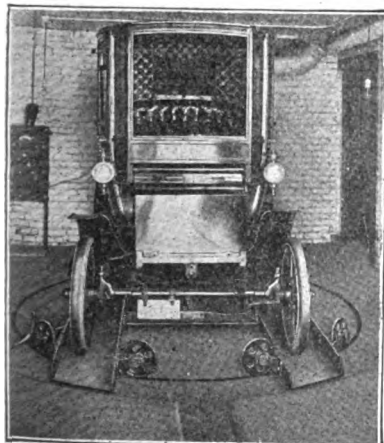
Schrader gauges may be obtained for \$1.00 from all manufacturers, jobbers, supply dealers, garages, or from

THE
Schrader
Tire Pressure Gauge
is absolutely
accurate
Ask Your
Tiremaker

A. Schrader's Son, Inc.

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New York



PITLESS Auto Turntable

Easily Installed

Made entirely of steel; equipped with ball bearings throughout.

Make your garage complete.

Write for catalog and prices.

PITLESS AUTO TURNTABLE CO.
9th & Walnut Sts.
KANSAS CITY, MO.

BELT AND MOTOR DRIVE AIR COMPRESSORS AND SUPPLIES

TO SUPPLY AIR FOR
INFLATING TIRES

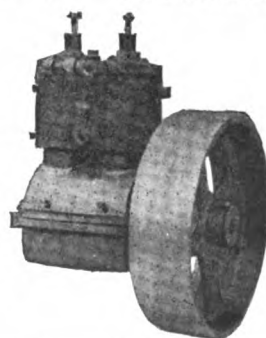
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Classified Advertisements

Under this head will be printed advertisements of Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines For Sale or to Exchange, at the uniform price of three cents a word, including the name and address, for each insertion, payable in advance. No advertisement will be inserted for less than 50 cents, however small. Remittances may be made in postage stamps or in any convenient way.

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

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AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 323 West 57th St., N. Y. City.

PATENTS SECURED—C. L. Parker, Patent attorney, 362 G Street, Washington, D. C. Inventor's Handbook upon request.

CYLINDERS REGROUND, and fitted with new pistons and rings for \$15.00 per cylinder. We make parts and cut gears of all kinds. Send us your old parts and we will repair or duplicate them in record time. Cracked cylinders, gear cases, etc., welded and made good as new. Aluminum, bronze and brass castings of every description. Phosphor bronze bushings in the rough carried in stock. Address, The Adapt Machinery Company, 1624 Wabash ave., Chicago, Ill.

DON'T FORGET.
FORD AGENTS—WE MAKE A SPECIALTY of Dust Hoods to cover Top when clashed down for Model T Ford 1910-1911-1912-1913 Cars. Write for prices, also Cellulosa, best Substitute for Glass used in Automobile and Buggy Storm Fronts, Side Curtains, etc., Sheets 20 x 36 in. 86c., 12 x 20 in. 36c., 18 x 20 in. 45c., 20 x 24 in. 68c., postpaid. Haews Storm Front Co., Coldwater, Mich.

AUTOMOBILE boilers bought, sold and repaired. Lucas & Son, Bridgeport, Conn.

MODEL T FORD OWNERS—You need my valve adjusters. They make a good car better. More power, better mileage, less noise. A good proposition to owner agents. Ira Lavender, Webster City, Iowa.

NEW ENGLAND AUTO LIST and TOURIST—Includes weekly list of all N. E. Auto Owners, Garages, Dealers, etc., with maps and selected N. E. routes, \$10.00 yearly. 138 Pearl st., Boston, Mass.

50 NEW pressed steel auto frames 163 in long, 34 in. wide. Send for sketch. \$10.00 each. Lucas & Son, Bridgeport, Conn.

DELIVERY CAR, closed body, 10 h.p.: just spent \$100 overhauling, \$150 new body and painting; will sell \$200. Chatfield, 312 W. 52d st., N. Y. City. (Telephone.)

PORTABLE GARAGES.

Garages—Portable-permanent, steel or wood Knapp System, 123 Liberty st., New York City, N. Y.

AUTOMOBILE CYLINDERS reground, new pistons and rings fitted. Garage air compressors. Cast Iron Brazing Co., Manchester, N. H.

DOES ANYONE OWE YOU?

ACCOUNTS
Collected Everywhere on Percentage.
NO COLLECTION, NO CHARGE.

MARCUS J. GOLDEN,
106 N. La Salle St., Chicago, Ill.

CYLINDERS REBORED, pistons and rings fitted, gear cutting of all kinds and materials, transmission and bev. gears of nickel steel hardened and tempered, guaranteed better than factory, crank shafts, connecting rods, crank cases, axles, any part of auto or motor reproduced like original, phosphor bronze bushings carried in stock, send old or broken parts to go by. The shop of quality, McCadden Machine Works, Minneapolis Branch, Minneapolis, Minn.

WELDING—\$\$\$\$\$\$ saved on auto parts. Ship all broken castings to us. Save time and \$\$\$\$\$\$. National Welding & Mfg. Co., Incorporated, Mfrs. of Complete Welding Plants, Welders and Brazers of all Metals, 526 Jackson blvd., Chicago, Ill.

WHEN your tires or tubes need repairing, send them to us. Our prices are lowest, we are always prompt and reliable. We sell all kinds of tires and accessories at special prices. It will pay you to "Get Acquainted." New York Steam Auto Tire Works, 312 West 52nd st., New York City.

TOPS REBUILT, recovered and repaired. For particulars address C. G. Meyer & Son, Tiffin, Ohio.

ATTENTION—Have a few manufacturers' samples, gentlemen's black broadcloth fur lined overcoats, lined throughout with Australian mink, large genuine Persian lamb collars, size 36 to 48, value \$75, will sacrifice for \$35 each. Also several ladies handsome long fur coats, satin lined, worth \$90, while they last \$35; and few large size fur robes, plush lined, \$15 each. All guaranteed new. Examine before buying. Send express charges. Will send on approval. Write or call. E. Roberts, Room 9, 160 West 119th St., New York.

TRUCK AGENTS WANTED

COMMISSIONS PAID without the purchase of demonstrator. If you have any prospects send for catalogs and discounts, 1,500 lb., 2,000 lb., 3,000 lb., 4,000 lb. Four cylinders. S. A. E tires, all oversize. See us on the second floor of the Coliseum Annex, Chicago. Ideal Auto Co., Fort Wayne, Ind.

BROKEN CRANKSHAFTS, crankcases, cylinders, flywheels, gerteeth, pistons, perfectly welded and machined ready to replace. Scored cylinders made new. Booklet, Atlas Welding Works, Rahway, N. J.

GOOD AGENTS WANTED

To sell new invention for automobiles. Saves 1-3 gasoline. Don't delay. Write us at once for territory. We have salesmen making \$50.00 per week. Natl. Mfg. Co., Kalamazoo, Mich.

FORD OWNERS WANTING FIVE ELECTRIC LIGHTS available any time using Ford magneto for charging a storage battery (self-contained system), write American Battery Company, 1126 Fulton st., Chicago.

FORE DOORS.

Made for all makes of cars. Prompt shipment guaranteed. F. E. Lortz Co., 2503 E. 56th st., Cleveland, O.

AUTOMOBILE AND MOTOR CYCLE TOURS—350 trips over the best roads in every State. Fifty-six large pages of maps and road direction. Twenty-five cents postpaid. Motor Tours, 51 Chambers st., New York.

FOR SALE—Large vulcanizing kettle, moulds and complete outfit—\$100. D. Ogden, Columbus, Ind.

COLEMAN'S WATERPROOF FILLER makes leaky mohair, duck and canvass tops waterproof. Faded tops brighter, easily applied, does not stiffen. \$2.00 per gallon. Guaranteed to give satisfaction. You order or have your dealer order. Virginia Waterproofing Corporation, 324 Arcade Bldg., Norfolk, Va.

MAKE YOUR OWN POLISH—\$10.00 will pay for thorough process, making high grade metal polish 25 cents per gallon. Instructions, formula, enough chemicals to mix up eight gallons included. Or start paying business of your own. Address Chemist, P. O. Box 654, New York City.

WELDING, broken cylinders, crank cases and crank shafts welded. Cylinders rebored including pistons and rings. \$7.00 to \$11.00. Sterling Engine Co., 331-333 S. Clinton st., Chicago, Ill.

MANAGER WANTED—In a Connecticut city for Accessory Store Company. Has \$15,000 capital and prefers man who can invest \$1,000. State experience and other details. Address, Mr. Martin, care of Chas. W. Hoyt, Advertising Agency, New Haven, Conn.

FORD OWNERS—New guaranteed Ford T radiators \$18.00. Model N. R. & S., complete with pump, \$23.00. Write for other makes. Autoparts Mfg. Co., Detroit, Mich.

MAXWELL SELF STARTERS—Prestolite Tank Starter. Don't break your back cranking that car when you can get a self starter made for your car for \$10.00. Autoparts Mfg. Co., Detroit, Mich.



The Livingston Radiator PROVED BY TEST

Radiators made or repaired for any type car.

Have a new radiator made for your car and increase its value 25 per cent.

Our corps of expert repairmen at your service. All charges based on time consumed. Results guaranteed.

Send in your old radiator and get estimate.

LIVINGSTON RADIATOR AND MFG. CO.

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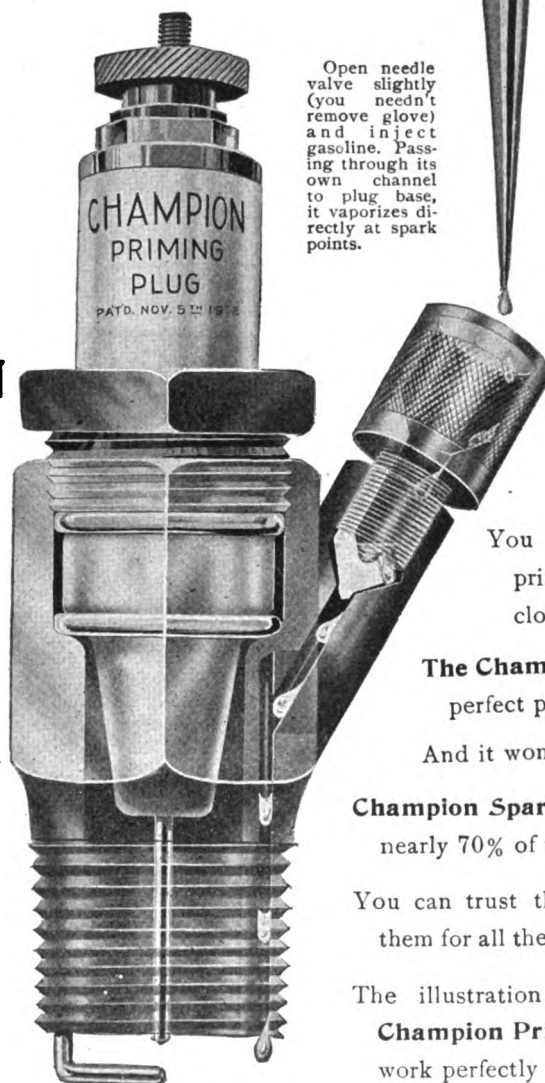
Champion Priming Plugs

Start Any Motor—In Any Kind of Weather

No matter
how cold
your car's
cylinders,

**CHAMPION
PRIMING
PLUGS**

will start
your motor
on the
first quarter
turn.



Open needle valve slightly (you needn't remove glove) and inject gasoline. Passing through its own channel to plug base, it vaporizes directly at spark points.

You must prime your motor in the winter—there's no alternative.

Cold chills the gasoline; it won't expand upward.

You can't send the best possible spark down far enough to fire it.

Present low test gasoline makes the problem still harder.

Champion Priming Plugs produce a rich mixture **right at the firing points**—then shoot a hot, sizzling spark right into it.

You can't get the same results with priming cups; they can't be placed close enough to the spark plug.

The Champion Priming Plug combines a perfect prime-r and a perfect spark plug.

And it won't "soot up" or leak compression.

Champion Spark Plugs are regular equipment on nearly 70% of the American cars today.

You can trust the good judgment that demands them for all the Fords, Overlands, Michigans, etc.

The illustration shows the simplicity of the **Champion Priming Plug**. It is guaranteed to work perfectly or your money back.

FOR SALE EVERYWHERE AT \$1.25 PER PLUG.

Trial Set of Four Champion Priming Plugs, fully guaranteed, prepaid to any car owner for \$5. Give name of car and year of make—also name of your dealer.

All jobbers and most dealers are already supplied. Write today. Liberal trade discount to dealers. Be ready to supply your trade while our big campaign is calling the attention of car owners everywhere to these priming plugs.

CHAMPION SPARK

112 UPTON AVE.



PLUG COMPANY,

TOLEDO, OHIO

Men Will Want These Things This Year in a "40"

Mark all the features listed below this cut.

Note the four forward speeds, the overwide tires, the center control, the left side drive.

Note the electric lights, the 14-inch cushions, the roomy, 22-coated body, the 50-inch rear seat.

Note the big springs, the big brakes, the immense over-capacity.

And note the price at which these things are given. Does any Forty you know make a comparable offer?

All Men Will Know

Our dominant advertising, all the time, keeps all these facts before motor car buyers.

They are bound to know—just as you know—that these things all belong to up-to-date cars.

And they'll know that no other car in this class makes an equal offer at the Michigan price.

It's a Cameron Car

This is not the product of an obscure engineer. It is built by W. H. Cameron, a man whose work is known the world over—who has built 100,000 successful cars.

The body is designed by John A. Campbell, whose body designs have been chosen by kings.

The concern back of the Michigan is one of the largest and strongest of its kind. And we waited four years to perfect this car before we came out in the limelight.

Scores of the ablest men have given their best to it. And 5,000 Michigans have been put on the road to test their 300 improvements.

The final result—the latest Michigan model—is one of the greatest cars of the day.

World-Wide Fame

The car has jumped, in the past four months, into almost world-wide fame.

Experts have come here from 11 foreign countries. They have selected the Michigan to compete in Europe with the finest foreign cars.

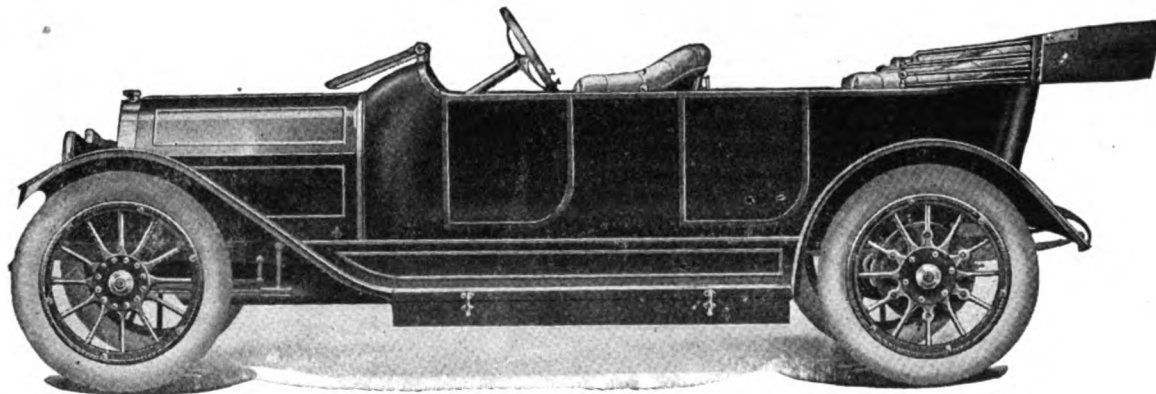
Hundreds of American dealers, who know the whole market, have chosen the Michigan as the greatest car in its class.

Such a verdict can't be avoided by any man who knows the facts.

We invite dealers and users to send for our catalog and the facts which they wish to know. (139)

MICHIGAN MOTOR CAR COMPANY, Kalamazoo, Michigan

Owned by the Owners of the Michigan Buggy Company



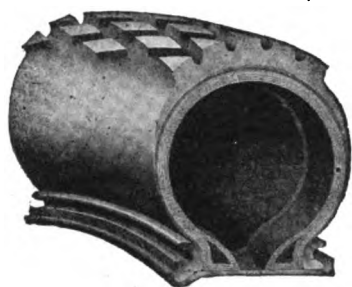
SOME OF THE MICHIGAN FEATURES

Four-forward-speed transmission
Oversize tires—35x4½
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Center control—left-side drive
Motor, 4¼x5¼
Extra effective brakes—18x2¼ ins.
Big, comfortable springs
Adjustable steering post
Adjustable pedals
Firestone Q. D. demountable rims—extra rim

14-inch Turkish cushions
Rear cushions 50 inches long
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Best curled-hair filling
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Nickel mountings
Large over-capacity, giving big factors of safety
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Axles sufficient for an 80-horse-power car

Genuine cellular-type radiator
Best mohair top, side curtains and envelope
Windshield built in as part of body
Electric horn
\$50 speedometer, 4-inch dial
Special foot rail
Swing robe rail
Rear tire irons
Complete tool equipment
Tool chests under running boards

There is such a difference of opinion about the various types of self-starters that we have not adopted any one type as regular equipment. We prefer to leave this selection to the buyer. We equip with either the gas or a positively efficient electric starter at moderate extra price.



No-Rim-Cut Tires

10% Oversize

By Far Outsell All Others

This Winter Tread Will Indicate Why the Goodyear Won

Last year we sold 918,687 automobile tires.

Yet we failed to keep up with the flood-like demand by some 400,000 tires.

Seven years ago only one tire in ninety was a Goodyear tire.

Three years ago the demand was still one-twelfth as large as now.

Last year's sales by far exceeded our previous 12 years put together.

Note the Double Thickness

In this Non-Skid tire we add an extra tread almost as thick as the regular. Thus we give you a double-thick tread.

This extra tread is of very tough rubber, immensely enduring, almost impervious to wear.

Because of its thickness, the blocks are deep cut. Their non-skid efficiency lasts for thousands of miles.

A Bulldog Grip

These sharp-cut blocks present to the road surface countless edges and angles.

They grasp the road in every direction with a fairly irresistible grip.

But the greatest advantage lies in the fact that these blocks widen out, so they meet at the base.

They are not separate projections, which center the strain on a small part of the fabric. They distribute the strain exactly the same as with smooth-tread tires. That's the main reason why the Goodyear Non-Skid gives such exceptional mileage.

Compare this tread with others. Compare its thickness, the depth of

its projections. Compare the apparent efficiency, due to these sharp-cut blocks.

Compare the way in which strains are distributed so the fabric can't be broken. One glance will show you that this Non-Skid surpasses anything else of its kind. About 250,000 of these treads have already been tested out.

Other Troubles Ended

Thus we have ended skidding troubles in the most effective way.

Years ago we ended rim-cutting, just as completely, just as efficiently.

Our patent tire—the No-Rim-Cut tire—has made rim cutting simply impossible.

What has awakened men to Goodyear tires in this overwhelming way?

This winter tread will tell you. It shows how far we go, in every way, to multiply efficiency. To cut down tire expense.

This is only one item, but it reveals the entire Goodyear code.

Compare this tread with others, and you'll see why Goodyears won.

And that alone cut tire expense 25 per cent.

Our 10 per cent oversize, under average conditions, adds 25 per cent to the tire mileage.

Our 14 years of ceaseless tests and comparisons have brought our tire quality up to the maximum.

These things together, in the test of time, have placed the Goodyears on at least a quarter million cars.

One Must Respect This Verdict

Remember, please, that tire expense forms your major cost of upkeep.

A tire which cuts that cost in two is something quite important.

Men know when they get it in these days of odometers. They know which tire serves best. And the final verdict of these men who know favors Goodyear tires.

Men have tried and compared now pretty close to 2,000,000 Goodyear tires. As a result the sale of these tires has doubled every year. And last year's increase was 125 per cent.

Now these tires by far outsell all others. And this year's output, if this increase continues, will completely equip 500,000 cars.

One may easily question any maker's claims. But when hundreds of thousands of users unite, one must respect their verdict.

The verdict of experience favors Goodyear tires in an overwhelming way. And every month makes the verdict more convincing.

Is it not fair to suppose that your experience will bring a like result?

If you think so, get that experience. Make some comparisons. Settle this question by next time insisting on Goodyear No-Rim-Cut tires.

Write for the Goodyear Tire Book—14th-year edition. It tells all that we know, after fourteen years, about cutting down tire expense.

GOOD YEAR
AKRON, OHIO.

No-Rim-Cut Tires
With or Without Non-Skid Treads

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO

Branches and Agencies in 103 Principal Cities
More Service Stations Than Any Other Tire

We Make All Kinds of Rubber Tires, Tire Accessories and Repair Outfits
Main Canadian Office, Toronto, Ont.—Canadian Factory, Bowmanville, Ont.

(934)

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What Shows Don't Show

By R. E. Olds, Designer

You'll see the new model of Reo the Fifth at your local Automobile Show.

It will strike you as beautiful, luxurious, roomy—having every final touch.

But here are things you can't see. And they mean, in the end, more than all that shows.

Tire Mileage

Tires on a car form the chief item in upkeep. Tire-saving means more than all other savings together. Every old motorist knows this.

So this year I add 30 per cent to my tire cost, to add 65 per cent to the average tire mileage. I give you tires 34x4. Compare them with rival cars.

The usual tires on this type of car would more than double your tire cost, so tire makers say.

No Possible Flaws

The steel in this car is twice analyzed, to make sure it accords with my costly requirements.

The gears are tested in a crushing machine, to prove that each tooth will stand 75,000 pounds. This test is usually made with light hammers.

The springs are tested in another machine, to stand 100,000 vibrations.

I use in this car 190 drop forgings. The average cost is twice that of steel castings.

But they give me lightness and strength. And hidden flaws can't occur in drop forgings.

The various parts of this car get a thousand inspections. Thus all the uncertainties are completely eradicated in building this Reo the Fifth.

No Broken Bearings

I use in this car 15 roller bearings, 11 of them Timken, 4 Hyatt High Duty.

They cost five times as much as the usual ball bearings. But good roller bearings don't break under strain.

No Overtax

It's the sudden shock which shows up a car's weakness, not the ordinary tests. And sudden shocks will come.

To withstand them, I give to axles and driving parts 50 per cent overcapacity. I have made them all ample for a 45-horsepower car.

To prove them out, I ran one of these cars for 10,000 miles, at top speed on rough roads. I met at its worst every possible road shock, and not one important part gave out.

I use 14-inch brake drums. I use 2-inch, 7-leaf springs. I use costly

steels—chrome nickel, vanadium, manganese—all to ward off an overtax. I place cost below safety in this Reo the Fifth.

No Troubles

That isn't quite true. All machines have their little troubles. But I've gone to the limit to save trouble with this car.

Each engine is tested 20 hours on the blocks, and 28 hours in the chassis. There are five long-continued tests.

My carburetor is doubly heated—with hot air and hot water—to save the troubles with low-grade gasoline.

I use a \$75 magneto to save ignition troubles. I use a centrifugal pump, instead of a syphon, to insure the water circulation. That costs about \$10 extra.

Cars are built slowly and carefully, parts ground over and over. I limit my output to 50 cars daily, so nothing shall be slighted.

No Skimping

To make my cars show my infinite pains, I give equal care to the finish.

The body has 17 coats. The luxurious upholstery is of genuine leather, filled with the best curled hair.

There are three electric lights, and the dashboard lights are flush. And the whole car, even under the hood, is fully nickel-trimmed.

Center Control

Our center control is exclusive to this car. All the gear shifting is done by one small handle, completely out of the way. It is done by moving this handle only three inches in each of four directions.

Both brakes are operated by foot pedals. So no levers at all clog the way of the driver. And this permits of the left side drive.

No other center control will please a man who once discovers this.

Add \$200 to My Cost

These extremes, I figure, add \$200 to the necessary cost of this car.

They cut down our profits. They force us to factory efficiency. They compel us to build every part ourselves. And, to minimize cost, we build only one chassis.

But these things save users from three to ten times what it costs me to give them to you.

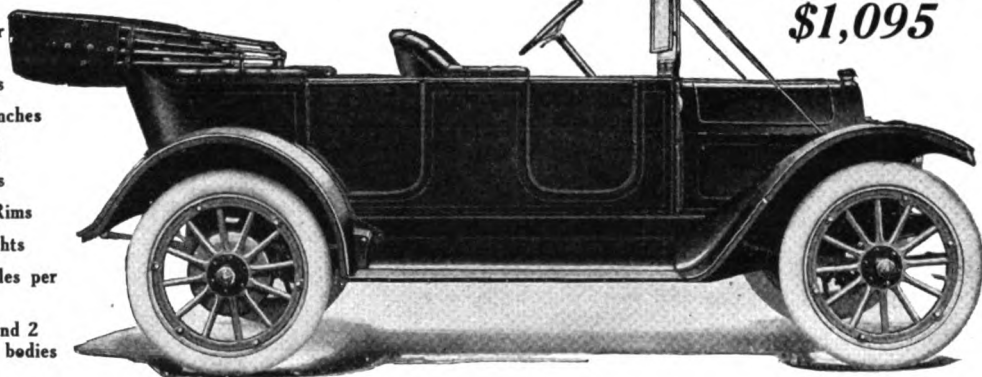
They insure to you safety, economy, comfort. They insure to me that

reputation I have spent 26 years in acquiring.

I find that car users, more and more, are coming to look for this class of car. Our output is always much oversold. And this year, with 60,000 excellent cars to my credit, the demand will be greater than ever.

A thousand dealers are now ready to show this new model of Reo the Fifth. Our 1913 catalog is also ready. Write us for it now.

30-35
Horsepower
Wheel Base—
112 inches
Tires—34x4 inches
Center Control
Roller Bearings
Demountable Rims
3 Electric Lights
Speed—45 Miles per
Hour
Made with 5 and 2
passenger bodies



Reo the Fifth
The 1913 Series
\$1,095

Top and windshield not included in price. We equip this car with mohair top, side curtains and slip cover, windshield, gas tank for headlights, speedometer, self-starter, extra rim and brackets—all for \$100 extra (list price \$170).

R. M. Owen & Co., General Sales Agents for **Reo Motor Car Co., Lansing, Mich.**

Canadian Factory, St. Catharines, Ont.

(136)

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Make Your Top Like New

Before

After

The next time you take your car out, look at the top—inside and outside. Those streaks of gray on the cover, those spots on the lining, indicate your top is fast going to pieces. You can save that top and make the lining like new quickly, easily and cheaply by using

RUB-R-TITE-AUTO-TOP WATERPROOF GUM-SURFACING

Applied with a brush, it gum-surfaces Mohair, Pantasote or Rubber tops, making a durable, waterproof surface as flexible as leather. It transforms an old top into a new one and covers up the fabric under the Gum-Surfacing. Almost unbelievable results can be accomplished by its use. By reducing Rub-R-Tite with an equal part of gasoline, some cloth tops can be most effectively and cheaply colored black and waterproofed. New tops treated thus will have twice the usual life.

RUB-ON-CONCENTRATED LINING DYE

Will evenly dye any spotted or faded top-lining perfectly black with one application. Put on with a sponge, without removing the top. Comes in concentrated form; does not attack rubber or separate fabric. Goes into the cloth and spreads in all directions, insuring an even color that cannot wash out or run when the top is wet. It will not fade more than a new cloth. Made in black only—other colors are impractical.

These two products and our Stay-On-Enamel for renewing Lamps, Horns, Radiators and Fenders, and our Sta-Fix Radiator Mend, which stops all leaks without soldering, are all recognized as standard goods everywhere. Keep these yourself, or have your garage-man keep them on hand—same as gasoline or oil—they will improve the appearance of your car, save you money, trouble and repair bills.

Every Can Guaranteed to Satisfy

Most supply houses carry these goods. If you want your car to keep new or you want to renew its shabby parts, ask your dealer or garage-man for our products. If he hasn't them, send us a postal with your name and address and we will promptly send price list, information, and samples of work FREE.


RUB-ON MANUFACTURING COMPANY, Dept. W. E. Buffalo, N. Y.

Garage-men and dealers, write for special trade proposition!



THE LITTLE STEERSMAN
THERE HE IS
MODERN AUTO APPLIANCE CO.
Chatham, N. Y.


A helical spring made of oil tempered steel wire, attached as illustrated, makes any car easier to control and helps prevent accidents, you should have one, ask your dealer or write for full information.



PORTER'S BOLT CLIPPERS
"Easy" "New Easy" Allen-Randall
To cut 5-16, 3-8, 1-2, 5-8, 3-4 inch.
H. K. PORTER, EVERETT, MASS.



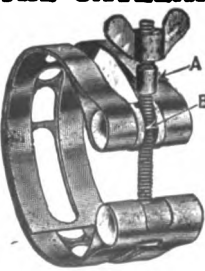
THE STAR SPEEDOMETER
is a well built mechanical Speed Indicator and Odometer. Its daily work and accuracy will please you. Send for booklet.
STAR SPEEDOMETER CO. Milton, Pa.



RUTENBER
The hood that conceals a
Rutenber Motor has nothing to conceal.
Guaranteed for Life.
Rutenber Motor Co., Marion, Ind.



COMPRESSED AIR OUTFITS
LEAST WEAR AND CARE
G.S. Comstock, Mechanicsburg, Pa.



THE GATELAIN HOSE CLAMP
Nothing has ever been created in this line comparable with it. This clamp can be attached or detached in a few seconds. It cannot slip, loosen, or cut the hose, and its strength, owing to its construction of hand metal, and the way the ends are overlapped, is simply a perfect clamp, and the price is very low. Let us tell you more about it, or if you are an automobile manufacturer or dealer, let us send you one for inspection.
A. G. Gatlain, 1446-48 Indiana Ave., Chicago, Ill.

HARRIS AUTOIL

If we can't show you—by a 30 days' test in your motor—that you never used a better oil even though you may have paid twice as much, the trial won't cost you one cent. We'll appreciate your inquiry for sample, price, and our free Booklet—*How To Tell Penna. Oils*.

HARRIS OIL COMPANY
606 Mulberry Street MUNCIE, IND.

RUBBER PUTTY FOR TIRES

The Greatest Invention of Its Class. A True Money Saver and a Protection to Life and Limb. See it at once for booklet giving further particulars and prices.


The Toledo Auto Devices Co.
709 Gardner Building, Toledo, Ohio.

GET THIS BOOK

It describes the most complete line of power

GARAGE PUMPS

made. It is sent FREE.
Better send for a copy today.
THE GARDNER GOVERNOR CO.
Station R, Quincy, Ill.



THE COLT AUTO JACK

combining SIMPLICITY, STRENGTH of construction, and excelling in lightness and power.
Weight, 6½ lbs. Capacity, one ton.
Ask for Catalog No. 152.
BATAVIA CLAMP CO.
184 Center St., Batavia, N. Y.

48 GREAT ENGINEERS BUILD THEIR FOUR-CYLINDER MASTERPIECE.

The great specialists of the automobile industry, working under the direction of Howard E. Coffin, have created the New Hudson "37," electric self-cracking and electric-lighted. There is no movement in operating this car which cannot be accomplished from the driver's seat. Write for further facts about the "37." **HUDSON MOTOR CAR CO., 7363 Jefferson Ave., Detroit, Mich.**

FORE-DOORS.

Bring your open-front car up-to-date. We make fore-doors to fit all standard makes of automobiles.
Write for prices and description.
AUTO SPECIALTY MFG CO.,
326-30 E. Market Street, Indianapolis, Ind.

Patent Pressures BETTER THAN AIR BAGS FOR VULCANIZING

RICHARDSON TIRE CO. Hartford, Conn.

Send for free sample of The Automobile Dealer and Repairer.
MOTOR VEHICLE PUBLISHING CO.,
71-73 Murray St., New York.

The GIBNEY

ELECTRICK VULCANIZERS


Cut down tire bills one-half, and more. A postal will bring to you an illustrated booklet telling how. Send for it now.

JAMES L. GIBNEY & BRO., 226 N. Broad St., Philadelphia, Pa.; 248-252 W. 54th St., New York City

Swinehart TIRES

Ride on Air—Laugh at Punctures
SEALO TIRE TREATMENT
Seals Punctures Instantly While You Ride

Sealo Tire Co., 1411 Michigan Ave., Chicago, Ill.



MONOGRAMS

Is your car exactly the same as hundreds of other cars of the same make? What marks your car as your own property? A Monogram will give it a mark of distinction and refinement.
Hickok Monograms are the best and our prices are low. Write for special proposition and booklet E today, now.
THE HICKOK MFG. CO. 44 St. Paul St., Rochester, N. Y.

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V-Ray

Announcement!



The New Porcelain

V-Ray

at the new

Price—\$1.00

represents the greatest
Spark-Plug Value ever
offered.

It was conceded a
great value at \$1.25
in 1912.

Now—better than
ever—it is \$1.00.

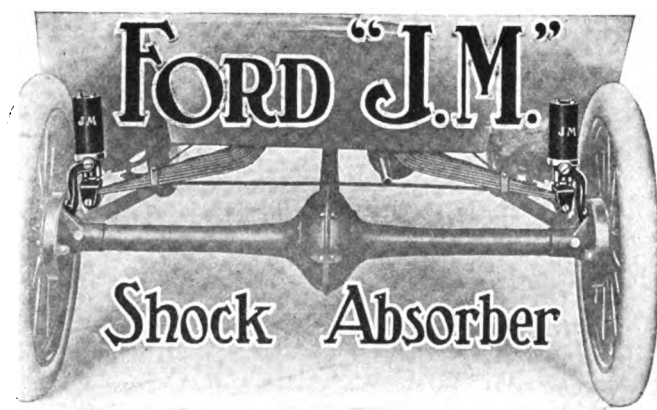
NO priming re-
quired. It's the one
great winter plug.



We were
formerly the
M. M. M. CO.

Note our new
corporate name →

THE V-RAY CO →
MARSHALLTOWN, IOWA.



Enjoy Your Ford Car
—get all the luxurious ease and comfort from it that the highest priced car can give.

The Ford J. M.

makes this easily possible. Unlike some shock absorbers, it does not arrest or lock the action of the springs—but serves as a perfect auxiliary to them, making riding doubly pleasurable, and cutting down wear and tear on tires and car.

Booklet "V" tells why thirty-five dollars invested in **Ford J. M. Shock Absorbers** makes your Ford Car the equal in riding qualities of a five-thousand dollar one. Write for it *today*.

See the J. M. at the Chicago Show—Spaces S 11 and 12 in Wilson Building, between Coliseum and 1st Regiment Armory.

The J. M. Shock Absorber Co.

Main Office and Factory

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CHICAGO, ILL., 1509 Michigan Ave.

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Branches in France, England, Germany, Russia, Belgium, Austria, Italy, Spain, Argentine Republic, South Africa and Australia.

AUTOMOBILE SPECIALTY IDEAS WANTED—Get in touch with us if you have invented some specialty and are seeking a market.



TIRES. TUBES. TIRES.

1912 STANDARD MAKES.

FREE SPECIAL OFFER FOR THIS MONTH ONLY.

\$3.00 Button Tire Cover given away with every purchase of tires. These tire covers are guaranteed waterproof and dust-proof and will be furnished in any size.

Highest grade stock, comprising of the best manufacturers. Cannot advertise names on account of the reduced prices we are selling them at.

Every tire is guaranteed brand new, perfect in every respect, and are not more than six months old. Some of these have the names of the makers on and others are buffed.

We thoroughly examine and test every tire and tube under heavy pressure to detect any weakness before shipping.

These are not the kind usually advertised. Nothing but the best stock is quoted in this ad.

Casings to fit Clinchers, Quick Detachable or Dunlop Straight Side Tires.

Size	Casing	Tube	Size	Casing	Tube
28x3	\$9.50	\$2.50	35x4	\$22.00	\$5.25
30x3	10.75	2.75	36x4	19.50	5.40
32x3	10.50	3.00	37x4	22.50	5.75
28x3½	12.00	3.00	32x4½	20.00	5.50
29x3½	14.50	3.15	33x4½	23.00	5.60
30x3½	14.50	3.75	34x4½	23.50	5.75
31x3½	15.00	3.75	35x4½	24.50	6.00
32x3½	15.00	3.90	36x4½	25.00	6.10
34x3½	15.75	4.15	37x4½	25.00	6.30
36x3½	15.00	4.25	34x5	20.00	6.00
30x4	16.50	4.60	35x5	25.50	6.25
31x4	17.00	4.75	36x5	26.00	6.50
32x4	17.50	4.90	37x5	28.00	6.75
33x4	19.00	5.00	37x5½	30.00	7.00
34x4	19.50	5.10			

Take advantage of these prices and free offer, as we cannot guarantee how long these prices will stand good.

We guarantee these tires and tubes to be strictly 1911 and 1912 goods.

We are one of the oldest and largest tire mail order houses in the United States, and you do not have to hesitate to send us an order with cash accompanied, as we can refer you to any Commercial Agency or Bank in New York, as to our references.

We agree to refund your money if goods are found unsatisfactory upon receipt.

We Ship Goods Subject to Examination.

INSIDE TIRE PROTECTORS.



Prevent blow-outs, punctures, and greatly increase mileage. These tire protectors are made from 8 to 6 ply of Egyptian fabric, with a self-seal flap reinforcing the rim and sides, always the weakest parts. Tube pinches are eliminated by the use of these protectors.

Order a complete set of them and save 100% on your tire expense.

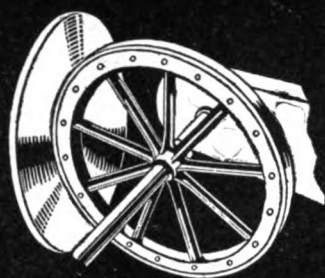
Size	Reg. Price	Cut Price	Size	Reg. Price	Cut Price
28x2½	\$4.65	\$2.40	35x4	\$7.00	\$4.90
28x3	4.75	2.60	36x4	7.75	5.00
30x3	4.90	2.95	32x4½	7.25	5.00
30x3½	5.25	3.35	34x4½	7.50	5.10
32x3½	5.50	3.55	35x4½	7.60	5.25
34x3½	5.75	3.95	36x4½	8.00	5.50
30x4	6.20	3.75	34x5	8.10	5.60
31x4	6.25	4.00	35x5	8.25	5.75
32x4	6.40	4.20	36x5	8.50	6.00
33x4	6.60	4.40	37x5	9.00	6.50
34x4	6.75	4.75	37x5½	9.25	6.75

Owing to the fact that our profits are very small, we sell for cash only, and under no circumstances otherwise.

C. O. D. orders filled if 10% is accompanied with order, to show good faith.

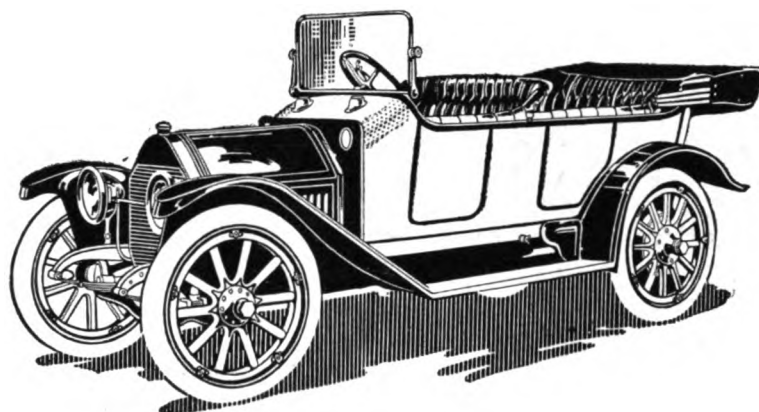
Send for complete list.

EXCELSIOR TIRE CO.,
1777 Broadway, New York City, N. Y.



The Gearless Transmission!

This is the car that will give you the best possible service under all conditions, because of the efficient and strong transmission. The Cartercar is strong just where the ordinary car is weak. It is simple, easy to drive, and always ready to go over any roads.



Greater Efficiency

A Cartercar has an unlimited number of speeds—one lever control—and will easily climb a 50% grade. The transmission is composed of only two unit parts—which must mean great reliability. Just consider what these features must mean to you.

Greater Tire Mileage

The tires on your Cartercar will wear about twice as long as on a gear car. This is because the transmission eliminates all jerks and jars in starting and changing speeds.

Electric Starting

Whether the weather is warm or cold, all you have to do to crank the motor is merely push down a small knob. Then turn this same knob and you light all or as many of the lamps as desired.

Four Excellent Models

The new Cartercar line includes four extremely good models—Touring Car, Roadster, Coupe and Sedan. They are finished elegantly, and with unusually deep upholstery and attractive lines. The prices range from \$1600 to \$2000, including equipment.

At All The Big Shows



Cartercar Company

Pontiac, Mich.

Branches:

New York
Detroit

Chicago

Kansas City
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IF YOU CAN SAFEGUARD Your Car---Your Life

BY USING

TRADE MARK
Raybestos
REG. U.S. PAT. OFF.

"THE ORIGINAL AND BEST ASBESTOS BRAKE LINING"

**Why accept inferior imitations of RAYBESTOS—
cheap substitutes that may fail in an emergency?**

We can't make this too strong—nothing is so all-important as efficient brake lining—likewise nothing is so all-important as RAYBESTOS. Consider the accidents, the lives lost, the trouble due to faulty brakes.

You wouldn't put your faith in "quack" medicines if your life was in the balance—then why consider inferior brake lining?

On the hills, in traffic, at the crossing, your life and the life of the occupants of your car are dependent upon the brakes. Don't take chances—don't flirt with danger. Demand RAYBESTOS lining as part-equipment on your car. If you need new lining tell your dealer or garage man to sell you RAYBESTOS.

**MAKE THAT CAR OF YOURS
A SAFE CAR!**

THE ROYAL EQUIPMENT COMPANY
450 Housatonic Ave., Bridgeport, Conn.

*We also make Duplex and Raymond
Brakes and Gyrex, the Mixer*



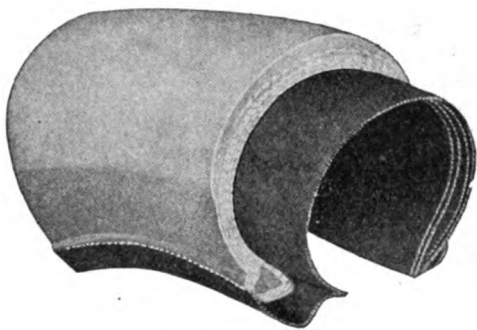
"Firestone"

ACCESSORIES

Are made from the master tire maker's knowledge of what is needed for quick, emergency road repairs.

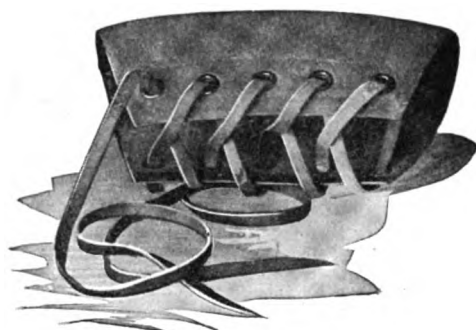
They are made by Firestone experts of the same quality which has made Firestone Tires the unquestioned general choice.

Firestone Accessories will boost your business and reputation.



INSIDE PATCHES

For blow-outs. Strong and stiff, with flaps to fit over bead. Made in all sizes up to 5½ inches, either 10 or 14 inches long.



LACE-ON-BOOTS

Prevent further injury when cut or blow-out occurs. Made from strong fabric with tough rubber on tread. Sizes for any emergency.



CURE CUT

For filling in tread cuts, preventing serious results. Also for small punctures.



CEMENTLESS PATCHES

For quick, handy roadside repairs without use of cement. Ready for instant use.

Firestone Repair Materials.—We have added to our repair materials until today the Firestone Line is the largest and most complete for any class of trade.

GET ACCESSORY CATALOG GIVING DETAILS AND ILLUSTRATIONS.

THE FIRESTONE TIRE & RUBBER CO., - AKRON, O.

"America's Largest Exclusive Tire and Rim Makers."

Branches and Service Stations in all Principal Cities.

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YOU CAN GET THIS FENDER

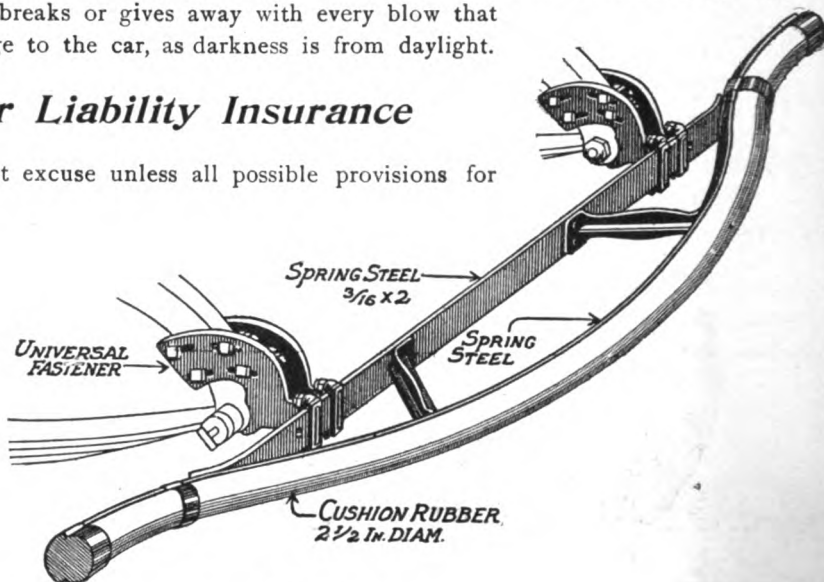
Put This Fender on Your Car for Protection

THE AUTO CUSHION FENDER not only protects the front of your car from damage, but also prevents many serious accidents that would inevitably occur without it. It is as different from the ordinary auto "bumper," which bends, breaks or gives away with every blow that is serious enough to do any real damage to the car, as darkness is from daylight.

Better than Life or Liability Insurance

In the first place the law does not excuse unless all possible provisions for safety have been taken advantage of.

THE AUTO CUSHION FENDER won't bend or break the first time you run into anything. It wards off blows without injury and absorbs the shock by means of the rubber cushion and the spring steel frame.



Auto Cushion Fender Company, 20 West Spring Street
COLUMBUS, OHIO

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FREE IF YOU DEMAND IT

THE AUTO CUSHION FENDER

*The Only Steel Truss Rubber Cushion Fender
in the World.*

It is handsome in appearance, although it is not made for ornament. It is made for the express purpose of protecting your car from damage, as well as many serious accidents to pedestrians.

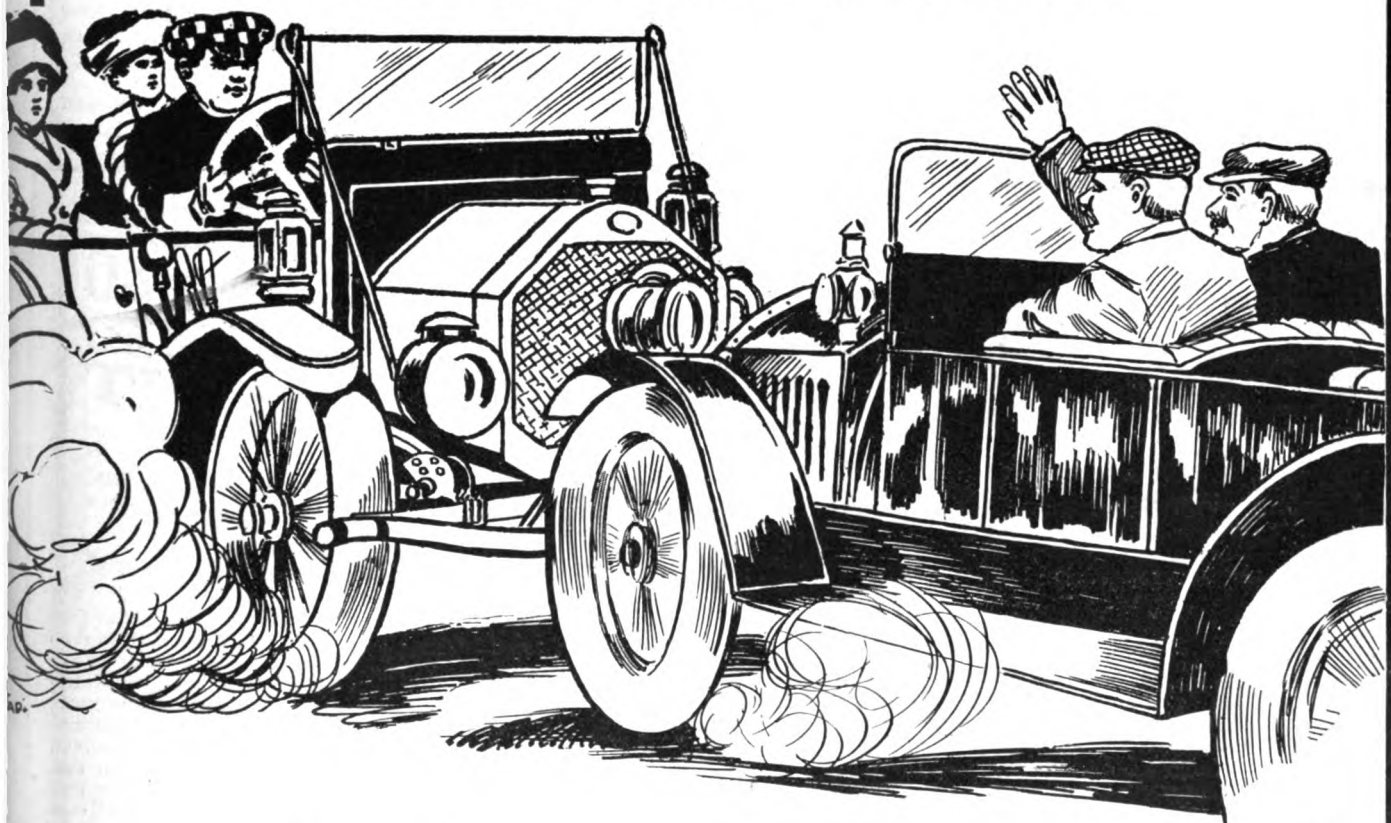
This fender is mechanically correct in design. You don't have to bore holes in the frame and weaken it. Our universal fastener fits any car and holds rigidly without trouble. Quick and easy to install.

Those who have used the Auto Cushion Fender know that it cannot fail.

You can get the Auto Cushion Fender free on your next car, if you demand it. If your dealer cannot supply you write us.

Catalog on request.

DEALERS and AGENTS write for territory.



**Auto Cushion Fender
Company**

20 West Spring Street,

COLUMBUS, OHIO

AUTO CUSHION FENDER COMPANY
20 West Spring St., Columbus, Ohio

Gentlemen:—Please send me full information and
price of your Auto Cushion Fender.

Name.....

Address.....

Save $\frac{9}{10}$ of Your Tire Repair Expense



For a cents you, yourself, can **permanently repair every puncture or blow-out in tube, or cut in casing.** Easier, quicker and better than vulcanizing. Costs one-tenth as much. No heat or tools needed. Nothing but your two hands and



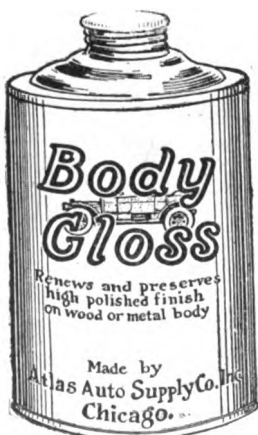
Use the Tire-Doh Outfit anywhere—in the shop or on the road. Cut your tire repair expense down to almost nothing. Tire-Doh means freedom from big tire repair bills and annoying delays. Double the life of your casings by promptly repairing cuts and blisters with Tire-Doh.

The outfit comes only in a white enameled can as shown above, and consists of one can of Tire-Doh, and one can of Tire-Doh Cement. Neither Tire-Doh nor Tire-Doh Cement is ever sold separately or under any other label.

Price now **\$1.** Just as much Tire-Doh and Tire-Doh Cement as in the old \$2 Outfit. Ask your dealer for a Tire-Doh Outfit today. Or send us \$1 for a Tire-Doh Outfit express prepaid. You run no risk. Money back if you ever ask it. But insist upon genuine Tire-Doh if you want our money-back guarantee.

ATLAS AUTO SUPPLY CO., 3247 W. Lake St., Chicago

Keep Your Car Looking Like New



Preserve the beautiful lustre and finish of your car. Use **BODY-GLOSS**. An hour's easy work once a month keeps a car shining and new looking. A wonderful varnish renewer. The only perfect refinisher. Easy to apply. Simply pour on cloth and rub on. Finish with dry cloth. Economical. A pint goes over any touring car twice. **BODY-GLOSS** will not restore the finish to a body that needs painting. But its use will preserve for an indefinite period the original lustre of a well finished car. Use **BODY-GLOSS** and your new car will *always* look new. Ask your dealer. Pint can, 75 cts.; Quart can, \$1.25.

ATLAS AUTO SUPPLY CO., 3247 W. Lake St., Chicago

FREE This coupon good for a sample can of Body-Gloss. Only one to each person. Present coupon at your dealer's.

Dealer's Name.....Name.....

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Atlas Auto Supply Co., Chicago.

One Rub

Turns Brass to Silver

Talk about your nickel plated lamps! In a few minutes you can silver plate every piece of bothersome brass or copper on your car. All you need is a piece of cheese-cloth and a bottle of



Get away from that cheap brassy look. Make your car look up-to-date. Use Silver-Quick and say goodbye to polishing forever. When long exposure has made the first coat dull, use Silver-Quick again. It's easier than polishing. Silver-Quick is not mercury or quicksilver. It gives a genuine silver plate. \$1

bottle will silver plate all brass work on any car. Make a note now to ask your dealer for a bottle of Silver-Quick. Or send us \$1 now. You run no risk. We absolutely guarantee Silver-Quick to be and do everything we claim for it. We will give you your money back if you ever ask for it.

ATLAS AUTO SUPPLY CO., 3247 W. Lake St., Chicago

Save Your Tires



Preserve your tires. Increase tire mileage. Make your tires look bright, white and new. Coat them with Preserv-O Tire Paint. Penetrates into every cut and crevice of the casing, leaving the tire coated with a new, perfectly waterproof surface. Preserv-O Tire Paint dries in 15 minutes and then cannot rub off. Cannot harm tires. Contains nothing not actually used in making the tires themselves. Economy, as well as pride in the appearance of your car, dictates the use of Preserv-O Tire Paint. This is the best tire paint on the market. A trial will prove it. Pint can, enough to coat six big tires, 50 cents. Get a can today of your dealer. You run no risk. Money back any time you ask for it.

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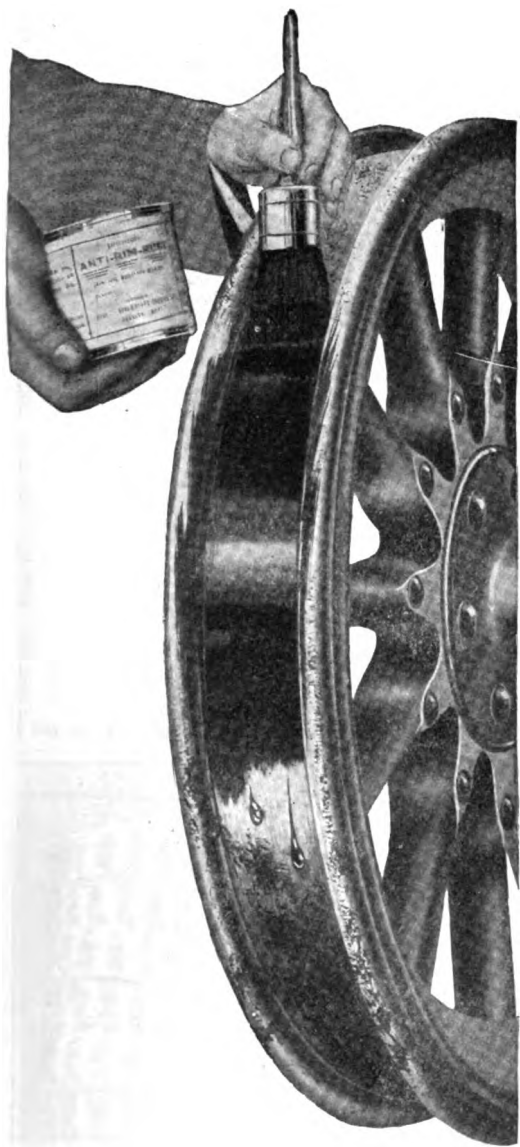
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Rust eats tires; rusty rims increase tire trouble and expense



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You can prevent all this; you can keep the rims from rusting; make tire changes easier, save money and trouble by painting your rims twice a season with

THOMAS' **ANTI-RIM-RUST** **PAINT**

This is a scientifically-compounded metallic paint, containing para rubber and graphite. Besides its wonderful usefulness in preventing destructive iron rust and making tire changes easier (especially when used on the rim bolts and lugs of motor trucks), it makes a lasting and efficient lubricant for spring leaves.

Get a can today from your dealer; if he is out of it, send one dollar to us; brings you full-sized can—enough for eight rims.

To Dealers

Thomas' Anti-Rim-Rust-Paint will be a fast-moving item in your stock; all car owners will ask for it. Discounts are extremely liberal. Drop us a line if your jobber can't supply you.

The Anti-Rust Paint Company

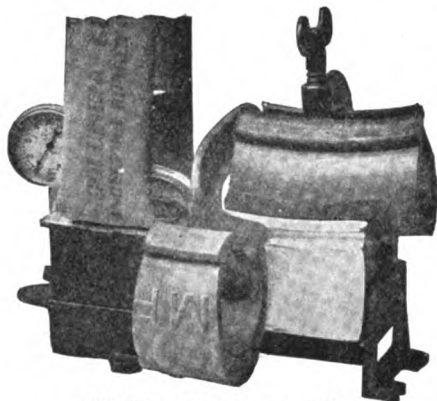
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Price \$15.00 **Handy Van Steam Vulcanizers** Price \$15.00

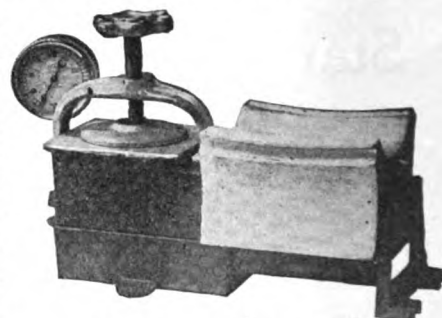
Are Made for the Auto Owner or Garage

Why you should buy a Handy Van Vulcanizer: It repairs Tubes and Cases on the tread or side with **slow curing** High Grade Rubber with steam, just as they do in the best and largest tire factories. If you want to reduce your tire expense and avoid delays and running to the shop, **order a Handy Van.** You'll say it's the best investment



3000 anticipated sales for 1913.

you've made since buying your car. Place it in your own garage, see how it is arranged. It's a Handy Van—repairs any sort of break. Don't delay repairs, they should be attended to at once, as water and mud increases the size of a break or cut very quickly. Our very low price of **\$15.00** places them so that every auto owner should have one.



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Equipped with Gas or Gasoline Burner.

We make large Shop Vulcanizers.

Our Catalogue tells you how to do the work.

VANDERPOOL TIRE & RUBBER CO., Springfield, Ohio.

*The tread
that
makes the
brake
effective*



The Safety Tread backs up the brake by pushing the ooze aside and gripping the road. The forward bar wipes a spot clean for the following bars to hold to—that stops the skid.

Every Goodrich Tire gives you the big, important, necessary feature of **Unit Construction.** By the Goodrich method of building and curing the tire as a unit—with **one** vulcanizing—it becomes one integral tire. The life, resilience and resistance of the thick, tough tread and the staunch body of the tire are blended. This is what gives the long service and reliability of Goodrich Tires, and means the **greatest** economy to the tire user.

Goodrich
SAFETY TREAD
Tires
"Best in the Short Stop"

THE B. F. GOODRICH COMPANY, AKRON, OHIO
THE LARGEST IN THE WORLD

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Prest-O-Starter

Starts your engine (old or new) quickly and easily in coldest weather

FOR FOUR CYLINDERS, \$20
FOR SIX CYLINDERS, \$25

\$1.50 extra for two-way valve necessary when the same Prest-O-Lite is used for both starting and stopping.

Here's a starter that adds practically no weight to your car, is perfectly simple and is as durable as the engine itself. Easily applied to any engine, old or new, very economical in the use of gas, and requires no expert repairing.

How Prest-O-Starter Works

The principle of starting a motor with Prest-O-Starter is the same as "starting on compression." A measure of acetylene, at low pressure, is pumped from your Prest-O-Lite into the cylinders.

Touch your spark—your engine starts.

Unlike "gasoline priming" it is not affected by heat or cold. It is certain.

In cool weather, by opening a valve on the dash, you can feed gas at low pressure into the intake manifold. This allows your engine to run on acetylene until it is warm enough to run on gasoline.

If the Prest-O-Starter did no more than prime your engine in this way during cold weather, this convenience would be well worth the price.

But Prest-O-Starter is more than a primer. When installed properly, it will start your engine, summer or winter, almost invariably without recourse to the crank.

Make Sure Your Starter is Installed CORRECTLY. Look it over!

The Prest-O-Starter is easy to install correctly. In fact, it's so very easy to install that some good factories and

garages install it with utter carelessness, overlooking the one or two simple features vital to success in operation. Fortunately this is an easy matter for the car owner to correct, even if he isn't a mechanic.

Our literature tells you exactly how the Prest-O-Starter is installed, and how to adjust it. Anyone can give it the slight attention it may need or quickly tell a dealer where the trouble lies.

Every Prest-O-Starter is sold with the assurance of satisfactory service. The entire Prest-O-Lite Organization is back of every one. If you have any trouble, report it to us or to our nearest branch. We'll wipe it out quickly.

Insist Upon GETTING the Outfit COMPLETE

During warm weather the connection which feeds acetylene into the intake manifold is not needed. So some dealers are not installing it. But in cold weather this feature is vital. You're entitled to it. It's included in the price, so see that you get it.

Now More Than Ever You Need One

Your Prest-O-Starter, properly installed, will average better than 95 starts out of 100 attempts. The few failures are caused by your motor stopping on dead center, or cylinders filled with burnt gas. Both of these conditions can be easily avoided when stopping your motor. But should either or both happen, an eighth or quarter turn of the crank, with the switch at neutral, will remedy the trouble at once, with all of the danger and labor of cranking eliminated.

Rest assured that no other starter can give you as high efficiency with as great economy, durability and freedom from mechanical trouble. The price is within easy reach.

Get in touch with any of our branches—or your dealer—or write us for descriptive literature.

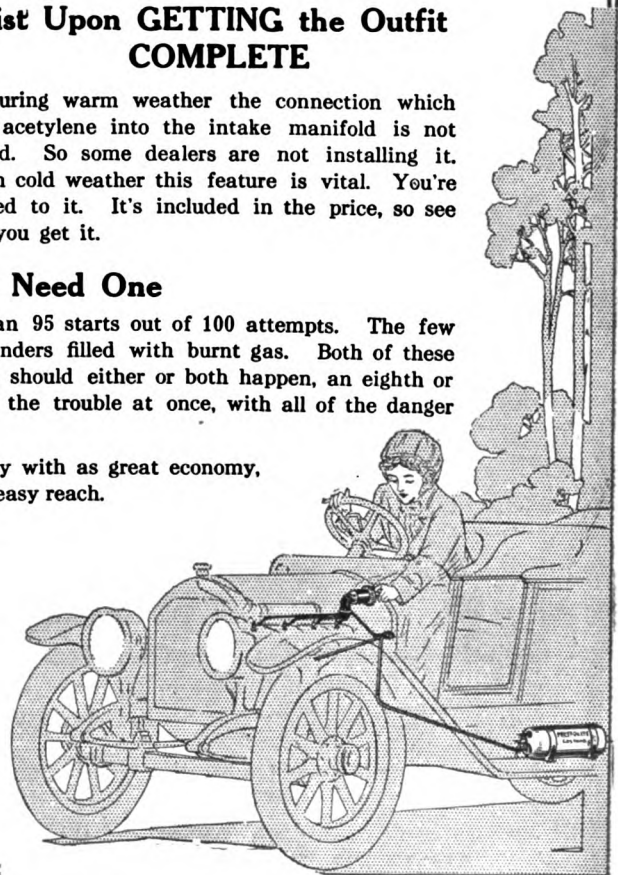
The Prest-O-Lite Co.

251 E. South Street Indianapolis, Ind.

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WE MAKE, from Start to Finish, the **FINEST LINE** OF ACCESSORIES, such as **BLOWOUT PATCHES—RELINERS—OUTSIDE BOOTS—RAW STOCKS** and **FABRICS** for **SELF-VULCANIZING OUTFITS**; also a **COMPLETE LINE** of **TIRE REPAIR RUBBER** and **FABRICS**.

WE ARE PREPARED TO DO MIXING and CALENDERING FOR THE TRADE.

A SPECIALTY MADE OF ALL KINDS OF MOULD WORK.

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THE AVON PATCH

SEVEN PLY

12 in.—14 in. Long.



3	\$1.00
3½	1.25
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BUILT LIKE A BRIDGE.

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To introduce the **AVON BLOW-OUT PATCH** we will send absolutely free, postage prepaid, any one of these articles with each **AVON Patch** ordered.

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GRAY SPECIALTY CO., - - - NEWARK, N. J.

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Patented Europe.



Patented America.

WELL! The **M & M Economizer** will **POSITIVELY** cut your gasoline bills in half. The **M & M** is nickel plated and highly polished. It requires a $\frac{3}{4}$ " pipe tap to insert into manifold.

It is guaranteed to increase your **SPEED** and **POWER** 20% with less gasoline and less carbon. It will **POSITIVELY** save you from 40 to 50% of gasoline. It is the only known carburetor adjuster on the market, and can be used for priming the engine.

ASK YOUR DEALER OR JOBBER ABOUT IT. If he fails to have it in stock, write to us.

The **M & M** is **GUARANTEED** to give satisfaction. **MONEY WILL BE REFUNDED** in 30 days if it fails to do what we claim. No dealer or jobber authorized to sell otherwise.

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PRICE OF AUTOMOBILE SIZE, \$3.50 complete, with friction control. (By mail, 17c. extra.)

Price of Motorcycle Size, \$1.25 prepaid.

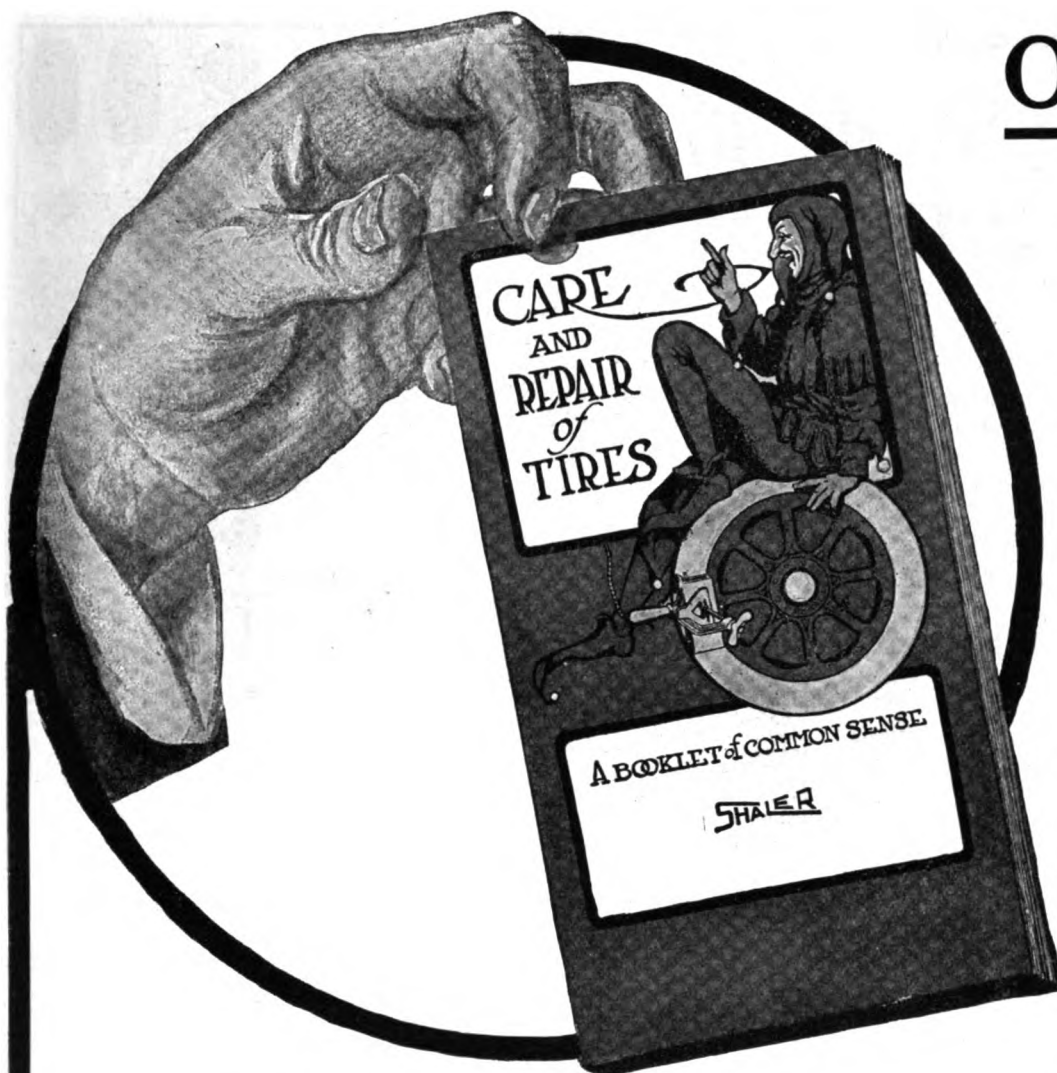
Send for 1915 catalog and full information.

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**TIRE
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"The best book on
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SHALER Vulcanizers

How they make one tire outwear three, by enabling you to seal cuts, punctures, sandpockets, etc., before dirt and water get inside to rot the fabric. The truth about vulcanizing and how anyone can do his own tire repairing at almost no expense, trebling the life of casings and eliminating tube repair bills. No experience necessary to use a Shaler because its temperature is controlled automatically. Heat is obtained from your city lighting circuit, or steam vulcanizers are furnished for use where electricity is inaccessible.

Prices \$10 and up.

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Send the coupon today
and learn how you can
treble your tire mileage.

C. A. Shaler Co., 800 Fourth St., Waupun, Wis.

Please send me, without cost or obligation, a copy of
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Size of Tires

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FREE Cut Shop Costs— Make work easier

Don't waste hours sharpening tools when you can do the toughest grinding or sharpening job on this grinder in a few minutes. Keen tools make all your work easier and help you do more work in shorter time—don't take my word—take this machine 30 days in your own shop and then, if you wish, send it back at my expense.

DIMO-GRIT—"the wheel for steel"—25 times faster than grindstone—10 times more efficient than emery—will not draw temper

DIMO-GRIT, the new artificial diamond abrasive, is a twin product of carborundum, but DIMO-GRIT is especially suitable for steel, leaving the smoothest, keenest edge—cuts hardest steel as emery does soft copper. It peels steel away in tiny shavings instead of wearing it away like grindstones or emery wheels—never glazes—no heat developed—no need of hard pressing, or water cooling—no danger of drawing temper. Genuine South African diamonds could cut steel no quicker. Outwears any number of emery wheels and grindstones. Carborundum wheels furnished if necessary.

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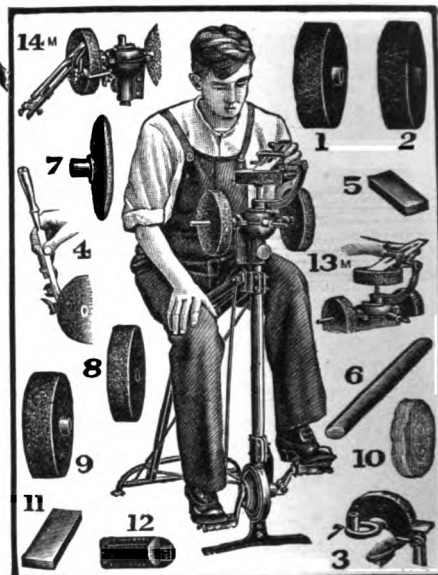
Engine and foot power—built all of steel—absolutely rigid—shaft drive like automobile—dust-proof ball bearings—gravity lubrication—runs 4000 revolutions by foot power—easy as sewing machine—guaranteed five years,—nothing to wear out.

**Complete Shop Assortment
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Including 14 sharpening attachments and accessories, providing for every grinding, sharpening and polishing need. Tool rests and attachments enable anyone to sharpen twist drills, gum saws, etc., as well as a

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Sharpening Stones.



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Write us a letter on your stationery and we will send our 30 days Free Trial Offer, and 40 page book reprinting McClure's Magazine article about artificial diamond abrasives. Write today and get full information and pick out the outfit for 30 days free trial.

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The BRENNAN

A HIGH GRADE
MODERATE PRICED
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**An Absolutely Reliable Motor
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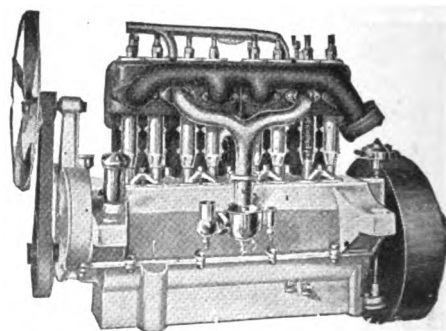
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**Insist on
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Accept no other.

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5 MINUTE CURE VULCANIZING CEMENT.

RUBBER ACCESSORIES.

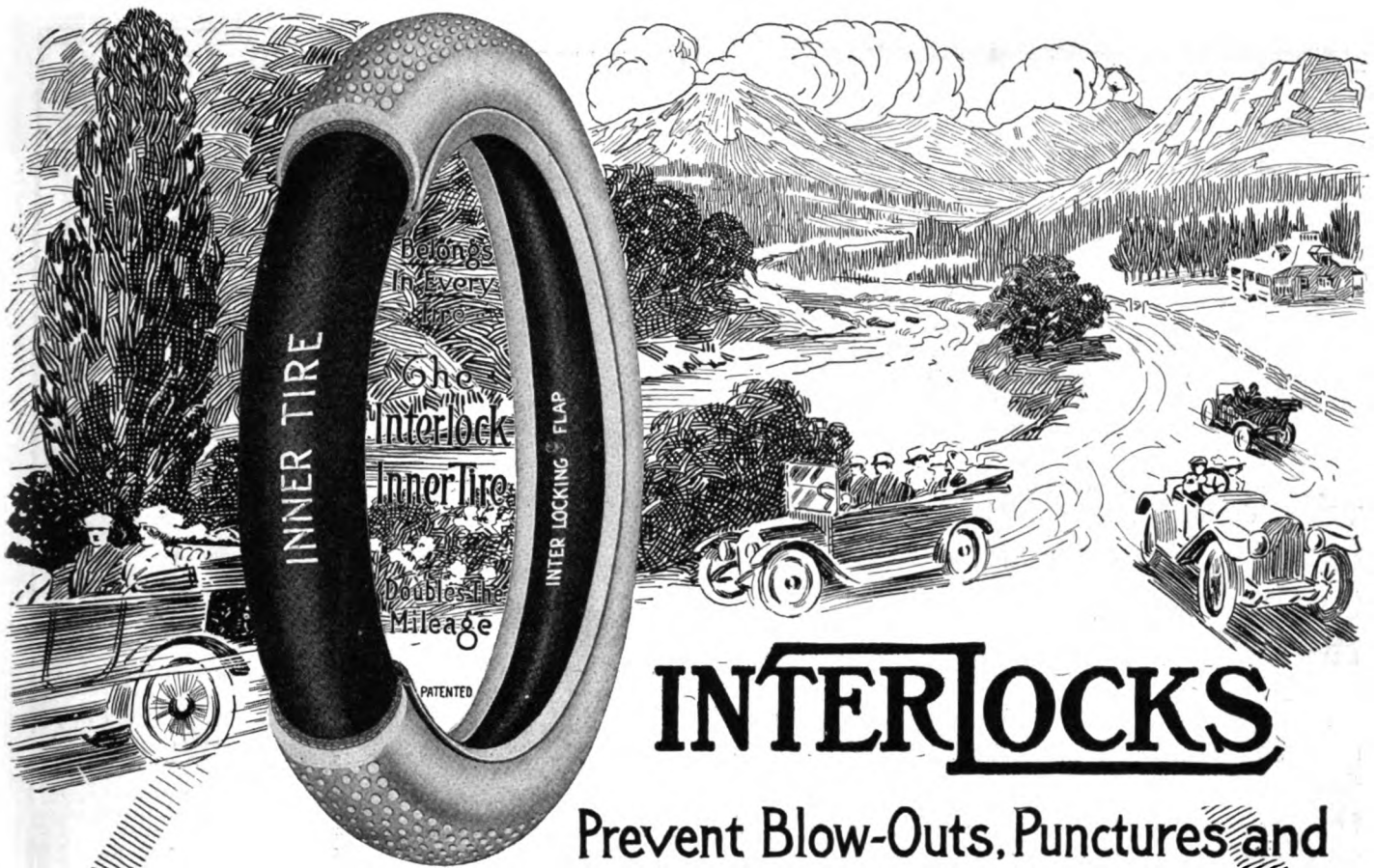
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COME and SIT in the chair of honor and register your name with us.

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Prevent Blow-Outs, Punctures and

Double Your Tire Mileage

If you really believed this you would order a set of Interlocks for your car at once. We can prove our statements if you will give us the opportunity. Thousands of car owners are using Interlock Inner Tires with the most satisfactory results. A set of Interlocks will carry most any car one or two seasons (according to use) without tire trouble.

What Interlocks Are Interlock Inner Tires are complete endless inner tires (not inner shoes) quickly and easily placed between the outer casing and the inner tube. They strengthen the casing and protect the inner tube from punctures. The patented Interlock Flaps lock the Interlock securely, making it an integral part of the whole tire that flexes perfectly and cannot chafe, creep or heat. Interlock Inner tires will hold even if the outer casing is broken, and can be used in old or new tires. They double the mileage of new tires and add 1,000 to 5,000 extra miles to old ones. Interlocks have a fine gray rubber finish, are smooth outside and inside and have no troublesome ends, joints or edges to cement. Interlocks do not affect the resilience of your tires—are easy to insert and can easily be removed from one tire and placed in another.

Proved best by Road Tests Interlock Inner Tires have stood the exacting test of hard road work. Eight tires equipped with Interlocks have made over 7,000 miles each, a total of 56,000 miles, without a blow-out or any tire trouble. Interlocks used in tires that have gone 10,000 miles with the outer casings worn clear through have kept up with fast cars equipped with new tires and carrying extra tires. Interlocks have made a 4,500 mile cross country run—the last 1,000 miles over 20 mountain ranges without a blow-out or even carrying an extra tire. In the Four States Run Interlocks stood the test of hard fast road work under the critical observation of tire experts, without tire trouble. These and other hard public tests have proved the efficiency of Interlock Inner Tires beyond question.

90% of All Tires are Scrapped Before the Rubber Tread is Half Worn Out

because the fabric is not strong enough to resist hard road work, resulting in blow-outs, punctures, rim cuts, etc. The liberal excess fabric strength of tires equipped with Interlocks prevents blow-outs, punctures, etc., gives extreme long mileage, safety, and that freedom from tire trouble which every car owner desires.

Write for Our Booklet Send us your address and let us mail you our booklets, data and testimonials of users which are very convincing. Interlocks are sold by the best dealers everywhere. Ask your dealer about them.

To Dealers and Agents Any dealer can do a large business by telling car owners about Interlocks. We want a live dealer in every town, and give positive selling assistance. Write promptly for booklet and our dealers' proposition.

See our Exhibits at New York, Chicago and Boston Shows

DOUBLE FABRIC TIRE CO.
18 9th St., Auburn, Ind.

The Only Way to compare



with other lubricants is to speak of the years of service it adds to the many working parts of the car.

In choosing your lubricants you must decide between those which save you a few cents in the purchase price and those which save you many dollars in reduced wear and tear.



**"K-000" Grade
NON-FLUID OIL**
is the motor-world-wide standard for use in the differential, the universal joints, the wheel bearings and in all grease cups.



**"K-00" Special Grade
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is the lubricant which has established an unapproachable record of efficiency in sliding gear transmissions.

Send for booklet "Lubrication of the Motor Car."
It contains more lubricating logic than any book
of its kind. Address Dept. A. M.

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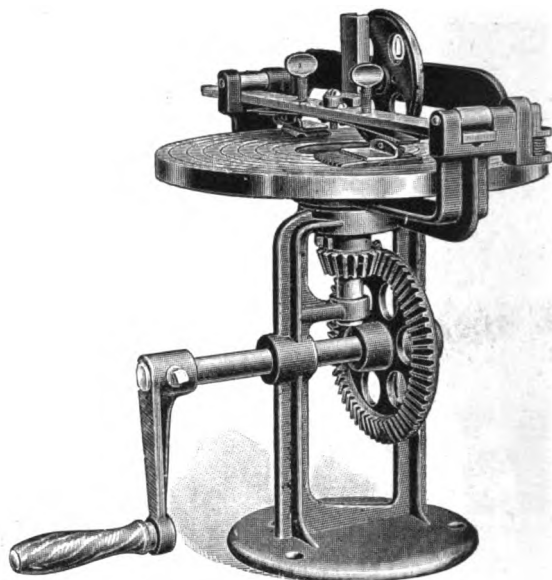
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"FAVORITE" CLIPPER GRINDER



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The plate is charged with grinding paste and the blades oscillated by means of a cam, as the plate revolves. It requires no skill or experience, and being automatic cannot be done wrong. Bearings are extra long and carefully fitted.

A pulley can be substituted for the crank and run by power if desired. About twenty-five turns of the crank will sharpen a set of Knives, and the Holders can be changed in two minutes.

Tube of Grinding Paste furnished free with each machine.

Write for Price.

THE HEATH FDY. & MFG. CO., Plymouth, Ohio

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Does Your Front Axle Radius Rod Rattle?
Try the Atlantic Anti-Rattler

A Special Model for Model T Ford.

Send for particulars and prices.

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AUTOMOBILE REPAIRS

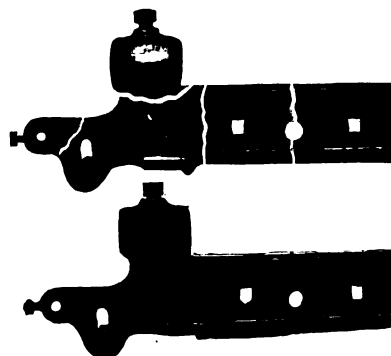
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ACETYLENE WELDING**

of all Broken Parts
**ALUMINUM CASES
AND CRACKED
CYLINDERS WELDED**

Transmission Cases, Intake
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We also design and build
special machinery and do a
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To Operate
Your Car
If You Use



HARRIS

TRADE MARK—REG. U.S. PAT. OFF.

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These Quality lubricants decrease cost for upkeep because they eliminate the injurious soot-deposits. They give you greater mileage for less cost and more power because of PERFECT lubrication. Over 25 years of experience are back of HARRIS OILS. All the knowledge, all the skill of these years goes into every drop. The result is a highly efficient engine operated at minimum cost. Prove this statement by trying HARRIS OILS.

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Motz Non-Skid Cushion Tires

End Tire Trouble Protect the Car

MOTZ NON-SKID CUSHION TIRES become the leading tires for pleasure electric cars, because they are easy riding and non-skid, yet sever puncture or blow out.

And owners of Motor Trucks prefer these tires, because they give excellent protection to the delicate mechanism of a car, yet are as dependable and serviceable as a solid tire.

We use, in this tire, the famous "417" rubber, which costs 50% more per pound than the ordinary kind. And we use nearly 50% more rubber than others use in tires of the same carrying capacity.

Note, too, the double, notched treads, the undercut sides and slantwise bridges—patented features.

This patented construction, together with the extra quality and quantity of rubber used, gives the Motz a resiliency hitherto unknown, save in pneumatic tires.

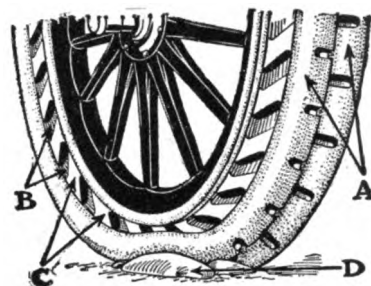
The Motz Non-Skid Cushion Tire is easily applied to any standard clincher, universal quick detachable or demountable rim.

You can learn more about Motz Non-Skid Cushion Tires at any of our branches, or by writing now, for our latest Tire Book 95.

THE MOTZ TIRE & RUBBER CO. AKRON, OHIO

BRANCHES—Boston, 4 Dundee St. Chicago, 2023 Michigan Ave. Cleveland, 1932 Euclid Ave. Detroit, 999 Woodward Ave. Kansas City, 409 East 15th St. Los Angeles, 336 W. Pico St. New York, 1737 Broadway. Philadelphia, 1409 Race St. Pittsburgh, 300 N. Craig St. St. Louis, 5187 Delmar Blvd.

See our exhibit at the Chicago Auto Show, space No. 27, Coliseum Gallery.



Motz Cushion Tires have double treads, which are notched, giving the Non-Skid feature; also distributing the weight to the undercut sides. The undercut sides are supported by slantwise elastic bridges, which give and yield like the air in pneumatic tires.

- A—Shows double, notched treads.
- B—Shows undercut sides.
- C—Shows slantwise bridges.
- D—Shows absorbing means when passing over an obstruction.

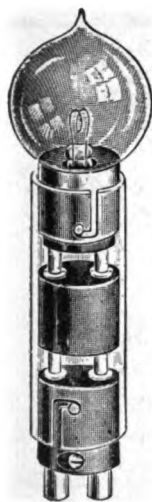
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ELECTRIC LIGHTING

FOR ELECTRIC AND
GASOLINE VEHICLES

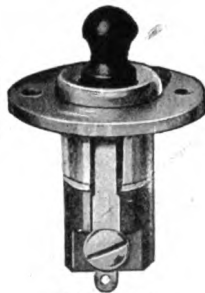
ADAPTERS, ELECTRIFIERS

TERMINALS, LIGHTING OUTFITS



No. 4 Type

Edi Swan and Edison
SOCKETS



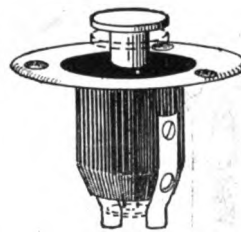
Style No. 984

Trouble, Inspection
and Garage Lamps



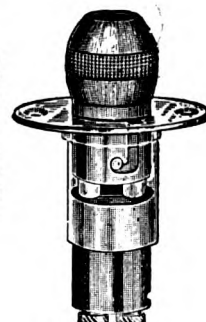
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Ignition and Lighting Switches



Style U

Edi Swan and Plug
Connectors



Type SS with Cap

FRANK W. MORSE, BOSTON, MASS.

TIRE PROTECTION GUARANTEED The "INNERSHU"

WRITE
INNER SHOE TIRE CO., Grand Rapids, Michigan

Get This Sure Protection Against Car Robbers The Watch Dog Lock

PATENT APPLIED FOR.
Price \$2.00. Write at once for Descriptive Circular.
S. BREAKSTONE
1712 Michigan Ave. Chicago, Ill.

Acetylene Gas Soldering Iron



For Soldering Radiators, etc. Attach to Prest-O-Lite or Generator. \$1 Prepaid.
C. K. HOERLE, Torrington, Ct.

STAPLEY TIRE PUMP

Made by Bridgeport Brass Co.
Inflates Tires Quickly and Easily
BRIDGEPORT BRASS COMPANY
P. O. Station D. Bridgeport, Conn.



"PERFECT" VEHICLE WASHERS

save labor, water and hose.
CATALOGUE
PERFECT MFG. CO.
ALBANY, N. Y.

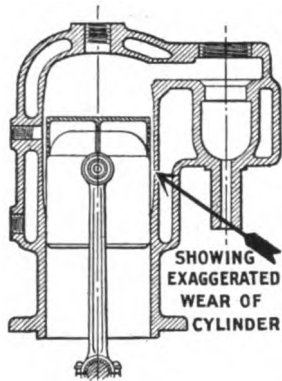
SIMPLICITY RECTIFIERS

The idea of this Rectifier is the charging of lighting and ignition batteries at one's own home, from an alternating current and at a particularly low cost. We guarantee every Simplicity Rectifier to be free from flaws of material and workmanship. This Rectifier will add at least one-third to the ordinary life of the best battery made.

Write at once for catalogue to the
WILSON SUPPLY COMPANY, 1191 Gladys Ave., CLEVELAND, OHIO

Please mention the Automobile Dealer and Repairer when writing to advertisers.

KEEP OUT OF THE RUT



Just because your motor isn't pulling with all the power it used to have, is no reason why you should tolerate poor compression, lack of power, waste of fuel and oil, noise and probably the smoke nuisance.

When the cylinders of your motor need reboring (and in time they surely will) you have some or all of these symptoms to contend with.

Don't get in the habit of thinking that you cannot help it. Just send us the cylinders and let us rebore them and fit new pistons and rings.

You will think that you have a new motor when you see what our work (and the way we do it) will accomplish. This reboring is a vital repair. It cannot be done under ordinary methods with anything like the accuracy our special machines attain. Why run the risk of having your motor ruined, when you can send your work to us with absolute confidence that we can and will repair it properly and accurately.

You would be surprised to know the number of high grade motors we have rebored and all with perfect success. Our process is a sure method of restoring power and compression where cylinders have worn or have been cut.

At this time of the year you can spare your car better than at any other, therefore look to the repairs **now**.

H. B. UNDERWOOD & CO.

(Established 1870)

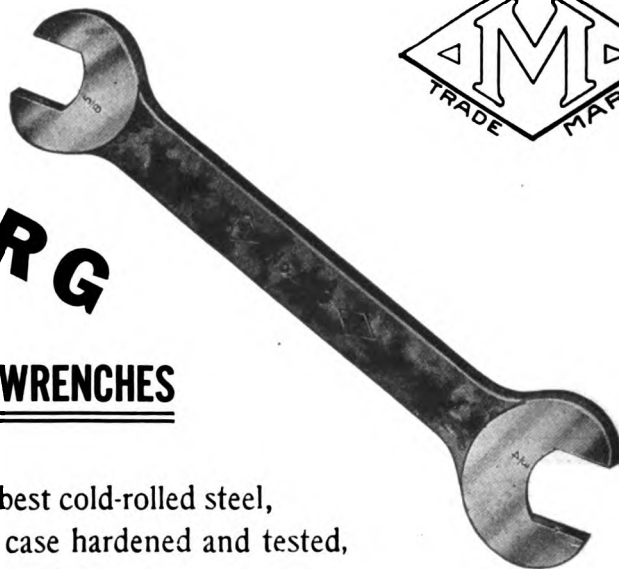
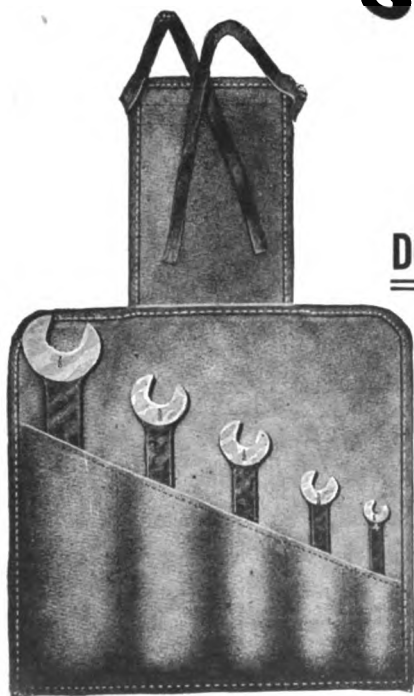
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Philadelphia, Pa.

MOSSBERG



DOUBLE END WRENCHES



- are made of best cold-rolled steel,
- are properly case hardened and tested,
- are light in weight,
- are proven as strong,
- are thinner and consequently can be used in "tighter" places,
- are more reasonable in price.

All because they are pressed out of steel instead of being cast or forged.

BE SHOWN—Catalog 143.

MOSSBERG

— AT —
ATTLEBORO, MASS.

THE MOTOR CAR COMBINATION VULCANIZER

For Tires and Tubes

The only Vulcanizer made with a gas generating burner.

Repair your Tubes and Tires and save the expense.

This Vulcanizer melts the rubber before vulcanizing it.

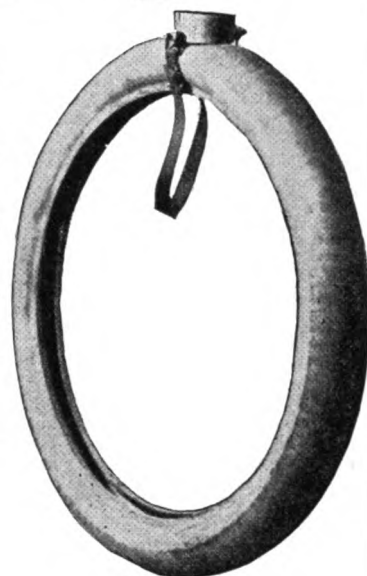
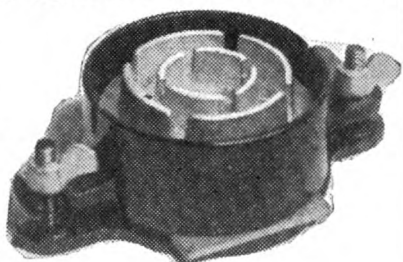
Entirely different from any vulcanizer made.

Retail price, \$2.50 complete.

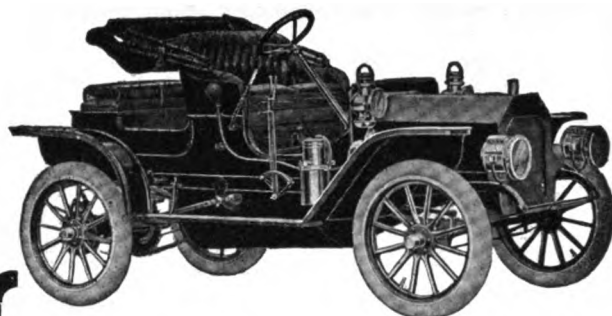
If your dealer does not handle it send for descriptive circular giving full particulars to

THE MOTOR CAR VULCANIZER CO.

Indianapolis,
Ind.



Patent Pending.



A Free Book for Auto Repair Men

The Auto Repairers' Guide & Price Maker is issued in the interest of automobile repairers, dealers and garage men—it's free to the trade and sent to them only.

Think of it, 480 pages of bargains—about 3000 illustrations—a complete auto repairers' guide and price maker—quotes lowest wholesale prices on first quality automobile supplies, auto repairers' tools, tool kits, spark plugs, horns, lamps, pumps, springs, forgings, brass fittings, batteries, coils, switches, auto tops and in fact everything used on an auto.

Write for your copy today, sending business card, letter-head or some other evidence that you are in the trade.

CRAY BROTHERS

JOBBER AND MANUFACTURERS OF AUTO ACCESSORIES

1119-1123 W. 11th St., Cleveland, Ohio

Extra Income for Automobile Dealers

"Prest-O-Lite (Motorcycle Size) is the ONLY practical light for motorcycles. It is the only one that makes night riding pleasant and SAFE."

Prest-O-Lite advertising is carrying this message to the motorcycle owners everywhere and building up big business for automobile dealers as well as motorcycle dealers both on installation and exchange.

This is a new and big opportunity—and it is getting bigger every day. There's a good profit in the sale of Prest-O-Lite to motorcyclists and a steady source of income from the exchange business.

Put out a sign, "Prest-O-Lite for Motorcycles."

Our Liberal Loan Proposition applies also to the motorcycle size and makes it easy for you to have plenty on hand, with only a little money invested.

Write us about this.

THE PREST-O-LITE COMPANY, 251 East South Street, Indianapolis, Ind.

CANADIAN GENERAL OFFICE AND FACTORY, MERRITTON, ONT.

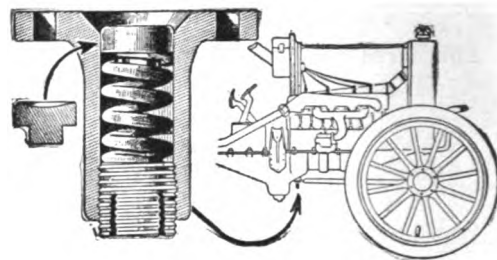
Branch Offices and Service Stations in all principal cities. Charging plants in all parts of the country.

Extensive foreign service.

Exchange Agencies Everywhere.



WARNING TO THE TRADE



The Apco Anti-Rattling Ball Socket for the front axle radius rod of the Ford Car is covered by letters patent No. 1044468 granted November 12, 1912, and we the undersigned have the sole and exclusive right to manufacture, use and sell same. Several concerns heretofore marketing this device have advised us that they will immediately discontinue, and we intend to vigorously prosecute future infringements. All sockets in the future will be stamped with our trade mark "Apco" and will be carried in stock by Ford dealers. Be sure yours comes in a sealed yellow box with our trade mark on the label.

Takes the place of the solid cap that holds the front axle Radius Rod in position and absolutely eliminates all rattle from this source besides automatically taking up the wear. To apply, simply remove present cap and replace with ours, the work of ten minutes without machine work of any kind.

The spring pressure is adjusted by screw plug in base and when adjustment is made plug is held by cotter pin through plug. Pack ball in grease before fastening cap in plug.

Licensed Price \$3.00; must not be sold for less.

For Sale by ATLANTIC MACHINE COMPANY, Brooklyn, N. Y.

AUTO PARTS CO., : : : PROVIDENCE, R. I.

CLEAN-UP SALE ^{ODDS and} _{ENDS} ! EVERYTHING for the AUTOMOBILE !

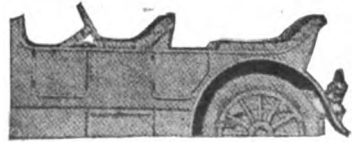
Body Bargains!!

New

FORE DOOR BODIES (5 PASSENGER), 34 in. WIDE, 92 in. long and 61 in. from dash to end of rear door.

Cost to build in 100 lots, - \$300

Our Price, \$100



We offer the public, while they last, these elegant bodies trimmed in the best quality of black leather, painted dark blue, at this immense reduction, because we purchased the entire plant of a well-known automobile manufacturer—\$100 CASH—F. O. B.—N. Y. City.

Red Tubes Sizes 3 3/4, 4 1/4 and 5 inches. From \$8 to \$5. Reg. \$5 to \$11.

Lamps HEADLIGHTS, 6-inch; regularly \$12.50; our price \$4.50 per pair. | LARGE \$25 HEADLIGHTS, 8-inch; regularly \$15; our price \$5.00 per pair. | Headlights \$9. BLACK AND BRASS OIL SIDE LAMPS, regularly \$6; our price \$3 per pair.

Tops TAIL LAMPS; large assortment; all sizes; worth \$2.50; our price \$1.25.

Generators New Goods, all sizes; regularly \$85 to \$100; Our Price \$15 to \$30.

Carburetors Regularly up to \$15; Our Price \$5.

Wind Shields All Sizes and Makes. \$2.50 up; reg. up to \$25.

Magnetos All High Grade Wooden and Brass Windshields; regularly \$45; our price \$5.

Speedometers All High Grade Wooden and Brass Windshields; regularly \$45; our price \$5.

Dorian Rim Sets (Demountables) Complete with Bands, Fitting, Wrenches, etc.; regular price up to \$80; our price, per set, \$15.

Self Starter (Disco & Blitzen) 4-cylinder; regular price \$40; our price \$7.50. 6-cylinder; regular price \$60; our price \$10.

Electric Horns All Best Makes; regularly \$20; Our Price \$4.75.

Presto Light Tanks All Best Makes; regularly \$25; Our Price \$13.50.

Tire Irons All Best Makes; regularly \$25; Our Price \$13.50.

Two Cyl. Splitdorf with Coil; reg. \$60; Our Price \$12.50.

Standard Make with trip and season Odrometer in head, 60 mile instrument; made to sell at \$25; our price \$4.50.

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	29x3 1/2 Firsts.....	12.00, regularly 19.15
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Tubes

SPECIAL JOB, in 30x4 1/2 Best Make Tubes, \$2.50.

New Cars	\$1,850 7-Pass. Touring.....	\$385
Special, at	1,100 5-Pass. Fore Door.....	685
CHICAGO	1,385 2-Pass. Roadster.....	885
Store Only	1,550 2-Pass. Roadster.....	885

All absolutely new. Best in their Class. Makers full guarantee.

Names and Particulars on request.

All large size Dunlops, 50 per cent. off Lists. All fresh stock, equal to any made. TRUCK TIRES, SODIUM RUBBER, NEARLY ALL SIZES; ALL LEADING MAKES; 34x4, regular price \$78; our price \$22.00. Other sizes proportionately low. Also BLOCK WHEELS, complete, regularly \$250; our price \$75.

RUMBLE SEATS; regularly \$25 to \$40; our price \$7.50, \$10 and \$12.

Also **BIG BARGAINS** in Motors, Frames, Radiators and 1,000 other articles belonging to the automobile.

If you cannot call, write, phone or wire. Prompt attention guaranteed. Do not delay if you want to secure a bargain.

200 USED CARS

Nearly every standard make represented here by cars that are good and merit the title.

Second hand in name only and lowest prices in the trade.

1708 to 1718 BROADWAY
(54th St.) NEW YORK CITY

TIMES SQUARE AUTO. CO. 1202 to 1212 MICHIGAN AVENUE, CHICAGO

Largest Dealers in the World in New and Used Cars and Accessories

Please mention the Automobile Dealer and Repairer when writing to advertisers.



"STORM KING" ULSTER

WILL SAVE FOUR GOOD SUITS IN ONE YEAR

by protecting them from the rough wear given any suit while automobiling.

Made from a material consisting of a layer of rubber between two layers of cloth, protecting the rubber, giving the coat longer life, and prevents the odor usually had from an ordinary rubber coat. **MACKINAW LINED.**

WARM WATERPROOF WIND, RAIN AND DUST PROOF

PRICE, \$18.00 DUCK LINING, \$15.00

Write for Catalog.

THE UPTHEGROVE SPORTING GOODS CO.
Valparaiso, Ind.

"The Chain That Lasts"



"BEST" TRACTION CHAINS

Still putting out the same quality.

Glad to tell you "Why" "they last."

H. E. McLain and Co.
162 Pond Street Natick, Mass.



THIS little book was written especially for beginners. Either the man who uses an engine for pleasure or profit, but who has not time to study a technical book.

It gives full details in connection with running gasoline engines, stated in simple language that anybody can comprehend. It contains numerous illustrations.

A copy will be sent you on receipt of the price, 25 cents, in postage stamps.

Motor Vehicle Publishing Co.,
71-73 Murray Street,
NEW YORK CITY.



This Tire Gauge FREE - - -

Reduces Tire Costs
Increases Resiliency
Lessens Chances Of Puncture
Accurately Tells How Much Air In Tires

This unusual offer is made for the purpose of placing in every car owner's hands an

ALLEN TYROMETER
TIRE PRESSURE GAUGE

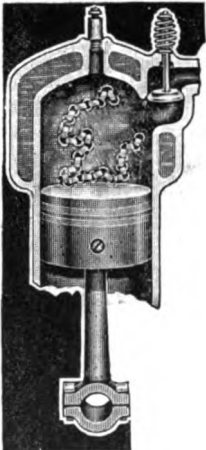
We offer it to you for a Ten Day Free Trial. At the end of ten days you will be so pleased with the TYROMETER that you will gladly remit the price, which is \$1.00. If not entirely satisfactory, you may return TYROMETER to us without obligating yourself.

Absolutely accurate. Handsomely nickel-plated. 4 1/2" long. Has clip cap. Press on valve and pressure is instantly shown and held until you release sliding band.

Drop a post card with your name and address and we'll send it at once by mail.

THE ALLEN AUTO SPECIALTY CO.
Manufacturers of the famous Allen Tire Case.
1924 Broadway, New York.

Michener Chain Carbon Remover



The cause of most engine trouble is carbon deposit in the cylinders. The sure signs of it are Fouled Spark Plugs—Loss of Compression—Pounding caused by Pre-Ignition.

Here is a device absolutely guaranteed to remove every particle of carbon from the pistons, top and sides of the cylinders, and sold with the distinct understanding that if not satisfactory to you after trying it your money will be returned.

It saves the expense and delay of tearing down the motor—eliminates disturbing the bearings and adjustments difficult to secure again—DOES NOT scratch or nick the metals, which a sharp-edge tool is liable to do by the old "hand scraping" way.

Price 75c. or 3 for \$2.00

If not sold by *your* dealer, fill in the order below and mail it to us.

You can clean two cylinders at the same time with Two Chains. *Always state kind of motor*, as chains are different sizes.

**E. S. MICHENER, 800 Washington Street,
New Castle, Pa.**

Please send by return mail, postpaid,..... Michener's Chain Carbon Removers for use in..... Motor. Enclosed is \$

It is understood that you are to refund this money if I am not pleased with the device after using it.

Name.....
Street.....
City and State.....

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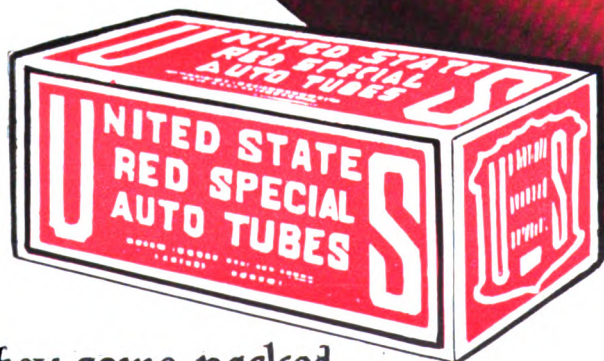
Here is a Winner in a

No tube
ever sold on the
American market has
ever approached this one,
either in appearance or durability.

United States

As every dealer well knows, there is an established demand in every part of the country for a really first class, extra tough, extra long-lived red tube. Motorists everywhere—particularly the owners of high-grade cars, are willing to pay an extra price for a special red tube if they can be assured of getting extra tube value for their money. And that is precisely what they get in a UNITED STATES RED SPECIAL TUBE.

The Red Special is decidedly the highest grade tube that has ever been sold on the American market. It is a tube that is not



They come packed
in a red carton
like this

United States

Please mention the Automobile Dealer and Repairer when writing to advertisers.

New Red Tube

Winning the trade of the man who owns the high-grade car will be easy for the dealer who handles this tube.

Red Special

only attractive in appearance but is also doubly attractive from the standpoint of economy on account of its extra toughness and wearing quality. Another very important point of superiority is the fact that after being inflated it will return absolutely to its original size. A tube that stretches is difficult to replace in a casing and is extremely liable to be pinched. Each Red Special Tube is enclosed in a red flannel bag and boxed in an attractive red carton. Everything about the tube will appeal to the man who wants a high-grade tube for high-grade service

cross-section
view

Tire Company

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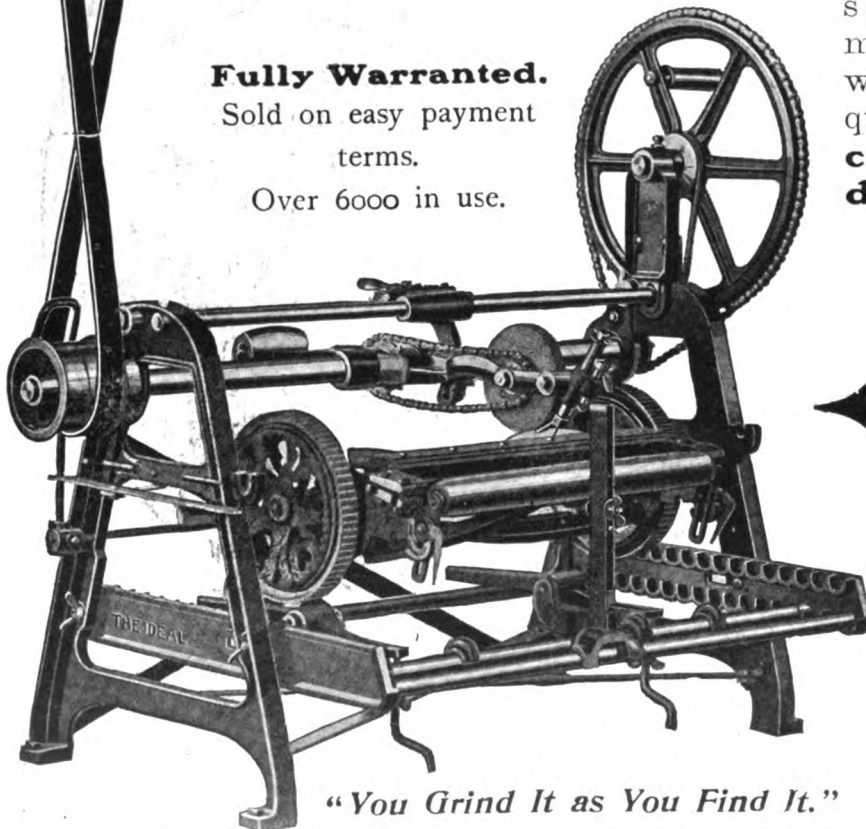
IDEAL

Lawn Mower Grinder

Grinds all makes of mowers perfectly in 15 minutes, without removing wheels, ratchets or reel-knife. Will also grind straight-blade without removing from mower. Has Skate Sharpener Attachment for sharpening skates. The only practical machine for sharpening Lawn Mowers on the market. Operated by either hand or power. Ball-Bearing Alundum Grinding Wheel and Main Shaft.

Write Today for full information of this great labor-saver and money-maker. Will do the work so much better, quicker and easier, you **cannot afford to do without it.**

Fully Warranted.
Sold on easy payment terms.
Over 6000 in use.

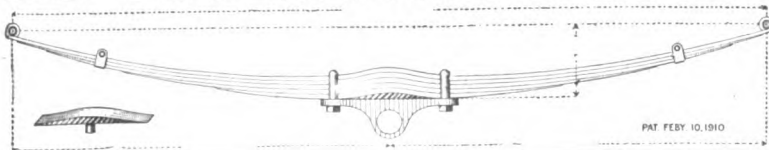


**Write today.
Don't delay.**

**THE HEATH
FOUNDRY
& MFG. CO.
PLYMOUTH
OHIO**

"You Grind It as You Find It."

DO YOU WANT A SPRING THAT WON'T BREAK?



Ask for **TITANIC SPRINGS**

Suitable to all makes and models of cars. They go on any car like any other spring. Guaranteed absolutely. If broken through the center for any reason, will replace at any time, and no questions asked. No center hole—the curved center and retaining plate hold the spring positively. No breakage—no hole to break in. Been tested on thousands of cars. We make all other styles of springs.

TUTHILL SPRING CO., :: :: 758 Polk St., Chicago.

**MENDENHALL'S
ROAD MAPS**

**MAPS AND GUIDES
FOR
AUTOMOBILISTS.**
SEND FOR CATALOGUE.
O. S. MENDENHALL, PUB.,
39 Opera Pl., Cincinnati, O.

If all oils are alike, we are wasting time and money in making
PANHARD OIL
the highest quality that can be produced. Write for new booklet.
GEORGE A. HAWS, 67 Pine St., New York.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



ENDURA SHEET PACKING

Tough as Rawhide

ENDURA Sheet Packing is a vegetable fibre chemically treated, and is used to supplant rubber and leather for gaskets.

SHEET ENDURA PACKING

Withstands the action of oils and water.

Will not deteriorate with age.

Will not soften or disintegrate under severe conditions which destroy other gaskets made from best packings.

Try ENDURA for your transmission gaskets, governors, pumps, and for every purpose wherever paper or leather is now used.

Let us tell you more about ENDURA. Our circular will give you all details. Ask for it now.

ENDURA MANUFACTURING CO.

6305 Eastwick Ave.,

Philadelphia.

ADD \$10 TO \$20 PROFIT TO EACH AUTOMOBILE SALE

Here's an easy way to pick up an extra Ten or Twenty Dollar Bill whenever you sell an automobile.

Just send us the name of the purchaser and we will endeavor to sell him an Edwards Private Portable Steel Garage.

That's all we want you to do—merely furnish us the name.

You Invest No Money or Time

It means \$9.25 to \$20 profit **FOR YOU** on each sale. And you've no money or time invested. Send us a list of all automobile owners in your locality, and on this plan you'll make a nice, clean profit—perhaps several hundred dollars.

The Edwards is far and away the most popular and widely advertised Private Garage. Our prices are much lower than others. And we've an excellent system of following up all names received. We won't miss any opportunities to close sales.

Write Us Now Send us your list of local auto owners at once, or we will be glad to answer any questions.



Edwards Fire-Proof Garage

An artistic, fire-proof steel structure for private use. Gives absolute protection from sneak thieves, joy riders, fire, lightning, accidents, carelessness, etc. Saves time, work, worry and trouble. Comes ready to set up. All parts cut and fitted. Simple, complete directions furnished. Absolutely rust-proof. Joints and seams permanently tight. Practically indestructible. Locks securely. Ample room for largest car and all equipment. Made by one of the largest makers of portable fire-proof buildings. Prompt, safe delivery and satisfaction guaranteed.

The Edwards Mfg. Co., 723-773 Eggleston Ave., Cincinnati, O.

WITH EYES HALF CLOSED.

Some readers go through a magazine just as they do through a garden or the woods. Their eyes are shut to a good deal that is interesting and useful and beautiful. It reminds us of the American drummer who is said to have spent "fifteen minutes in the British Museum." Having gone to the British Museum at all he might have spent days and weeks there and learned something, but as it was he saw next to nothing and it cost him more than he got out of it.

So, likewise, the hurried American who spends fifteen minutes reading this magazine sees and learns very little. Even if he reads closely only the reading pages he misses much that is of value to him, for every advertiser has a message for the reader. This message may not always be so clearly expressed, but if he did not have the message he would not advertise.

Look over the advertising pages closely then and see if there is not something in them that is worth your while. Of course no advertiser takes space enough to tell the whole story. He can merely suggest, and cannot begin to exhaust the subject. You will find something new in every issue that you did not know before. It may save you a few dollars or a few hundred dollars; you will know best after you have found out particulars.

The man who thinks it doesn't pay to read the advertisements can hardly be called a good business man.

"THE LIGHT UNIVERSAL"

"In Exchange for your empty tank, accept only a genuine Prest-O-Lite Tank, filled with genuine Prest-O-Lite Gas."

This is the message that is going to Prest-O-Lite users everywhere.

In it there is a hint for the wise dealer, as well.

You know that no imitator of Prest-O-Lite has ever successfully imitated Prest-O-Lite Service.

You also know that no imitator ever made good the large claim, "more and better gas than Prest-O-Lite."

So does your customer.

Imitations are getting harder and harder to sell. There are now mighty few dealers trying it.

Most of those who yielded to the old but ever tempting claim, "More Profits," have come back home.

To the dealer who is still trying to force imitations on the people who won't have them, perhaps because he has money tied up in them, we can only say:

"The sooner you resume earning your good old Prest-O-Lite profit, the sooner you will make your income what it used to be."

The Prest-O-Lite Co. 251 E. South St. Indianapolis, Ind.
CANADIAN GENERAL OFFICE AND FACTORY: MERRITTON, ONT.
Branch Offices and Service Stations in all principal cities.
Charging Plants in all parts of the country.
Extensive foreign service.

Exchange Agencies Everywhere.



"Happy Now They Have it"

**PATENT
LUXURY
FOLDING SEATS**
*The
Seats that
Satisfy*

A NECESSITY OF HIGH GRADE CAR EQUIPMENT

Made from steel drop forgings.

Artistic in design and finish.

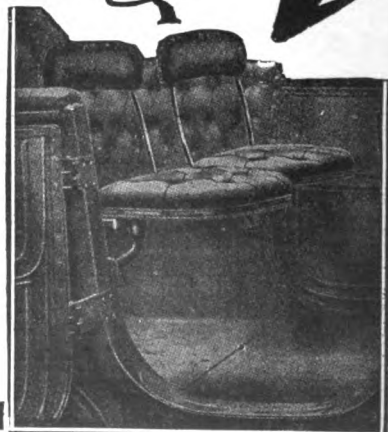
COMPACT DURABLE RUGGED

Write for catalog showing various models.

HODGE & GRAVES CO.

AMESBURY

MASS.



Please mention the Automobile Dealer and Repairer when writing to advertisers.

Our Rhoades' Battery Ignition System

does not make use of Vibrators, Relays or Timer, its operation being entirely mechanical, which insures results superior to the magneto. (Can be installed in one hour's time.)



Three years of hard continuous service in the hands of hundreds of pleased customers insures its reliability.

We guarantee more power, speed, flexibility and general satisfaction than your car has ever shown.

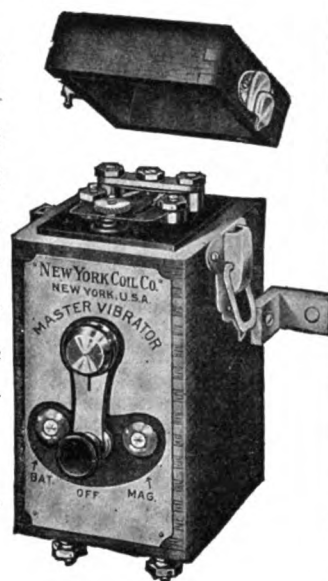
Write at once for new prices and exchange proposition. You will be surprised what a wonderful change can be made for so little money.



Our new Model T Master Vibrator for Ford Cars

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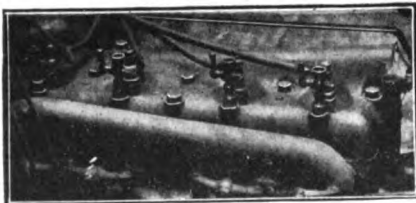
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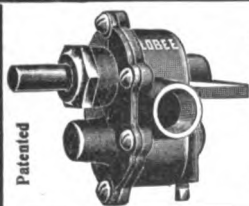
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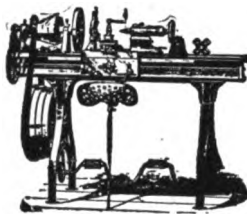
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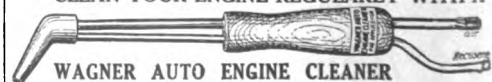


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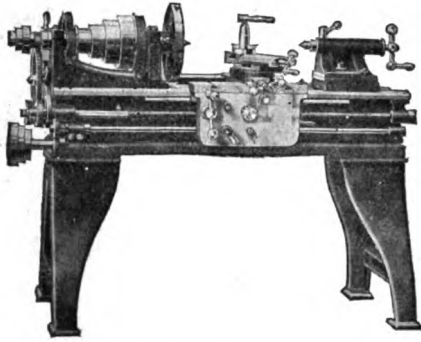
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One qt. of kerosene and 6 lbs. air pressure cleans all dirt, grit and grease from any engine. Prevents wear and actually saves half the usual repairs. This cleaner is quick, economical, thorough, easy and cleanly to operate. Cleans everywhere thoroughly. A necessity for repair shops.

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Vulcanizer With Three Cavities**



As a Progressive Business Man you should by all means use,
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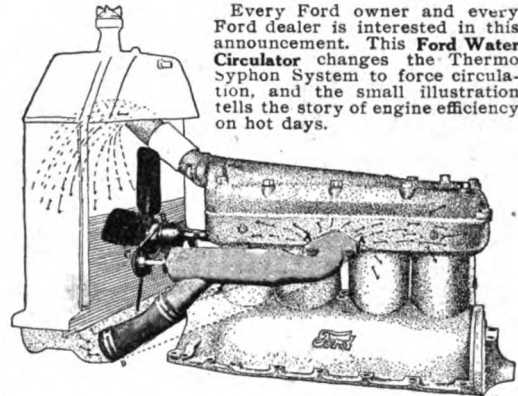
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simply and solely because it is the best there is in Vulcanizers at any price
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In your own interest, get posted—Write to us to-day.

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Every Ford owner and every
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Circulator** changes the Thermo
Siphon System to force circula-
tion, and the small illustration
tells the story of engine efficiency
on hot days.

The Ford Water Circulator

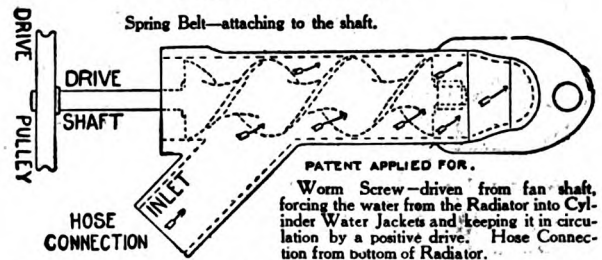
forces the water through the cylinder water jacket by
the positive drive of the worm screw, insuring rapid
circulation with mechanical pressure back of it, giving

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The Ford water circulator can be installed in twenty
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Always in motion when engine is running—prac-
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It saves engine wear and tear, promotes
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to a rebate of \$2.50
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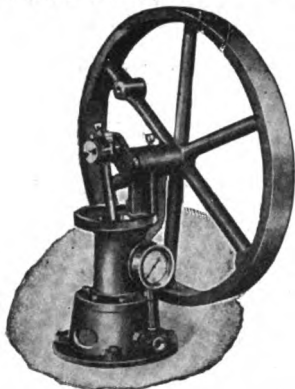
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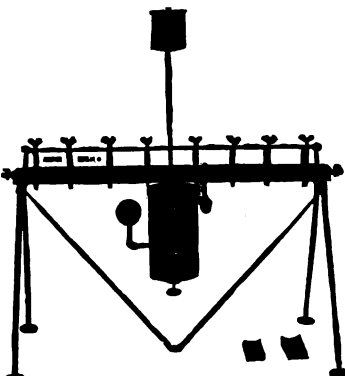


MILLER'S HIGH PRESSURE AIR PUMP is Oil Cooled with our Fountain Oiling System. The Bearings and Valves are extra large. The Bore of the cylinder is 3 1/2 inches in diameter and the Stroke is 5 inches. Diameter of Fly Wheel is 20 inches with 8 inch Face. Approximate Weight, 200 lbs. This pump will easily compress air to 300 lbs. pressure.

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Innerliners in one piece 100 ft. long, 3 or 4 ply, 50c per lb., less 5% for cash.

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PRICES FROM \$5.00 to \$30.00

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No-Cement Patches, per dozen packages 2.50
No-Cement Patching Rubber, sheet form, per lb. 2.00
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Fabric Common Tire Cloth, 18 ounces, one or two sides65
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with Tube Attachment

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That repairs everything in the Tire line—all sizes of bicycle, motor cycle, auto and aeroplane tires, also 4 to 6 inner tubes at one time. Made and designed by the man who originated and patented the Cavity Vulcanizer, so generally used throughout the world.



Furnished complete for Steam Line, Gas or Gasoline Burner.

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A Perfect Pail for Washing Car.

Patent Applied for.

Will Reduce Soap Consumption at Least One-third



DOVER ELECTRIC LIGHT BULB CASE

Made of Steel, Finished in Black Enamel.

SAFE and Very Compact. Capacity, 2 Head, 2 Side, Tail and Speedometer.

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DOVER SAVAL MEASURE and FUNNEL

with Automatic Shut-off. Pat. Oct. 22, 1912.

Prevents Overflowing Oil Tank and Spilling Oil Over Engine and Other Parts.

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This pump made especially for 1913 Cadillac Cars.

Metal Pistons with Cast Iron Piston Rings on each.

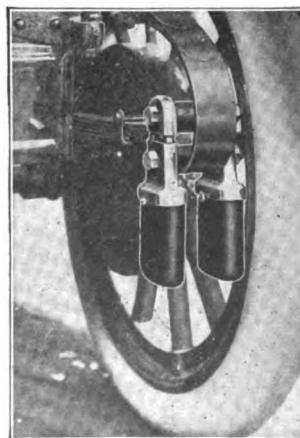
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Anyone can attach it.

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VELVET SPRINGS are resilient shackles and compel your car to ride easily over roughest roads and cobblestones.

They save your tires and the entire car.

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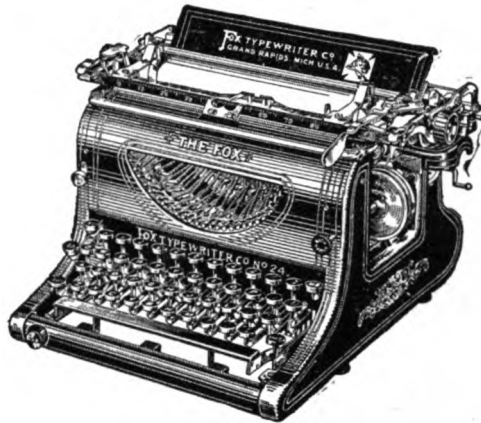
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It has a Tabulator, Back Space Key, Two-Color Ribbon with Automatic Movement, both Oscillating and Reversing, and Removable Spools, Interchangeable Carriages and Platens, Card Holder, Stencil Cutting Device, Variable Line Spacer and Line Lock with Key Release. Its speed is fast enough for the speediest operator or slow enough for the beginner. It is extremely Durable and almost Noiseless.

This is the New Fox No. 24
"BETTER THAN THE BEST OF ALL OTHERS"

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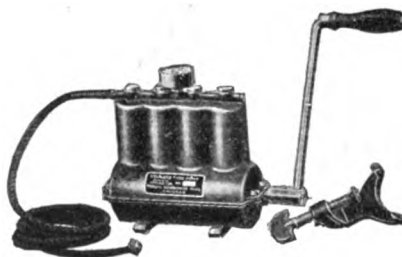
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They are operated by a knob which together with the gauge is mounted on the dash. No lifting hood, stopping engine or shifting of gears is necessary.

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2"x2½"
3"x3½"



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RESULTS WHEN YOU INSTALL A

CURTIS

Common Sense Garage Pump

Belt one to line shaft or motor, start her up in the A. M., then forget about it, then you'll have **AIR ALWAYS ON TAP**—free to your patrons. It will give you a pull over the "other fellow."

It will cost you only a one-cent stamp to send us your address. Do this and let us send you full particulars and prices of our various sizes and styles of Garage Air Compressors.



Either 2x2½ in. or 3x3½ in. on base as above, or short leg base without tank.

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PRINCETON, N. J., May, 4.—Governor Woodrow Wilson attended to his correspondence today as usual, being little bothered by the crash would be revised when his auto struck a mound in the road and jolted him against a rib in the roof of the car.

When the Governor met the correspondent he was wearing a narrow strip of plaster and gave a good laugh over the incident.

THE JOUNCE THAT BOUNCED WILSON! COULD HAVE BEEN PREVENTED HAD HIS CAR BEEN EQUIPPED WITH ACME TORSION SPRINGS "DON'T JOUNCE" "DON'T BOUNCE"

Insurance for life of occupants, car, and easy riding. Equip your car with Acme Torsion Springs. Don't be fooled by "shock absorbers." What you want is more spring capacity under proper Automatic Control. Acme Torsion Springs add at least 18 feet to the total leaf spring area, every inch adding greater resiliency automatically controlled.

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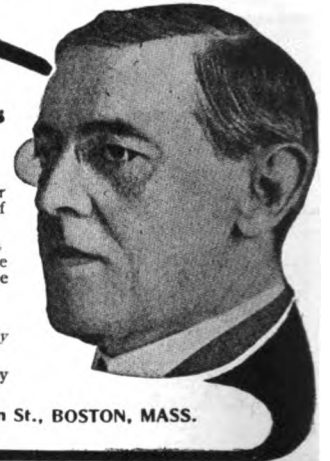
Eliminate Vibration and you eliminate trouble.

Adaptable to all types of leaf springs. Quickly and easily applied by anyone. Satisfaction guaranteed.

We have convinced thousands, let us convince you. Write today for information.

ACME TORSION SPRING CO.,

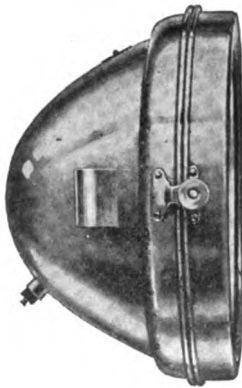
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Great White Ray

Get Guide Book
No. 6

Guide
Electric Headlight
TORPEDO TYPE



1913 Design
as good as it looks

We are printing another edition of "The Truth About Automobile Lamps." Shall we send you a copy?
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SPLITDORF

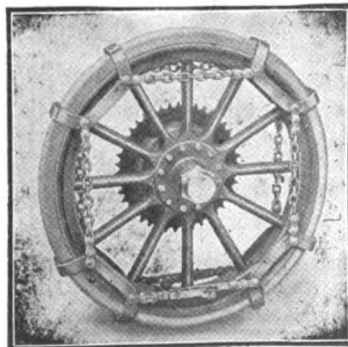
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The new non-vibrating "TS" SPLITDORF COIL is equally effective with all the newer as well as older models of the famous SPLITDORF low tension system.

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Designed and made expressly for solid tires. Built for continuous hard service.

"Quick Attachable" and compact in form.

Made of Nickel Steel.

Will not injure the tires.

Every set guaranteed.

Territory open for good representatives.

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The Russell Tire Case fastens on the bead, being held snugly to tire by a flat, flexible spring, concealed in its edge, and a hook on one bead goes into pocket on the other bead edge. This allows great adjustability of case around tire.

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No complaints of breakage—and thousands in use.

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AUTOMATIC IN ACTION SAGER SHOCK ABSORBERS

60 DAYS' FREE TRIAL

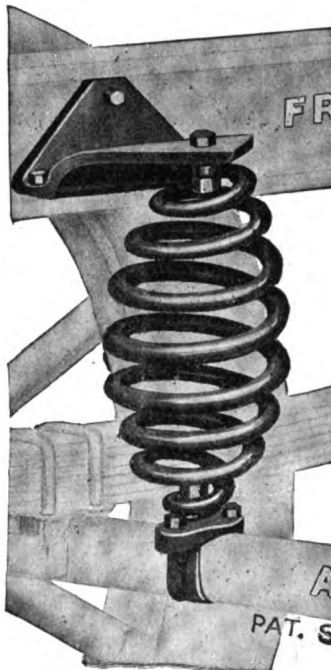
Have proven for seven years to be mechanically correct; prevent recoil and bumping of springs. Saving of 40% on tires and machinery. Destroy all shocks of rough roads. Insure greater speed and at the same time greater comfort to car occupants.

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"We are entirely satisfied with them."
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"They add greatly to comfort and reliability."
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"Have given us excellent satisfaction."
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"They are the best shock absorbers I have ever used and I cheerfully recommend them to anyone desiring increased comfort and pleasure."
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"The success of your shock absorbers has interested us considerably."
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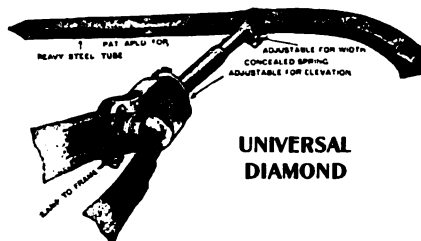
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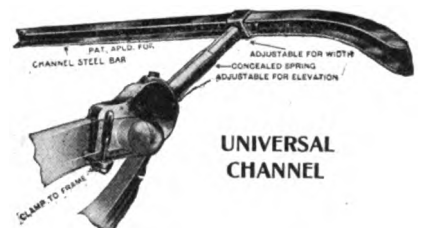
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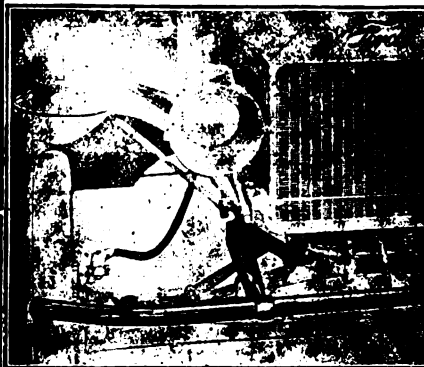
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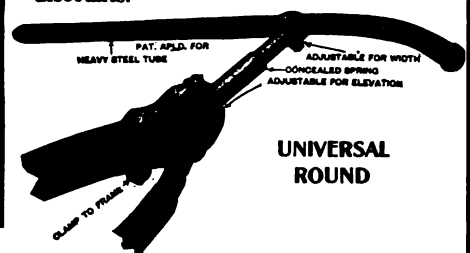
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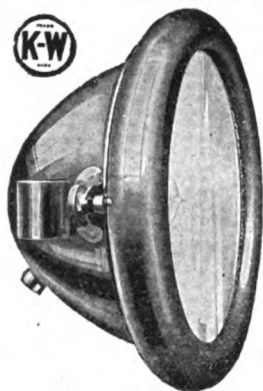
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ELECTRIC HEAD LIGHT OUTFIT \$35.00

Complete Electric Headlights

FOR FORD CARS \$15.00
With Fly-Wheel Magneto



The successor to the gas tank.
Current direct from Magneto.

The K-W Outfits manufactured for this purpose are not makeshifts, but are complete in every detail.

The Outfit Complete, which is all you need, consists of
1 pair complete Head Lamps.
2 Tungsten bulbs, 2 1/16" in diameter.
12 feet wire, all soldered to lamps.

1 Lighting Switch.
Instruction Sheet for Wiring.

The Lamps are made entirely of one piece of brass drawn from steel dies; have no soldered joints, easy to polish, and make a handsome lamp for the Ford cars. They fit the forks furnished on the Ford cars.

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The chief value in an Electric Head Lamp is a perfect reflector. The K-W Reflector is a reflecting lens,

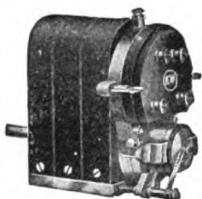
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For all cars having provision for Magneto

Model J
Guaranteed to
Start Auto
Engines up to
30 H. P.

We make larger Magneto for larger engines. High Tension Magneto are for Ignition use only. Use Low Tension for lights.



No Coil
No Timer
No Batteries
4 Cylinder, \$50
6 Cylinder, \$55

If you cannot gear-drive a High-Tension Magneto, use one of our Low Tension belt or friction-drive Magneto and a K-W Spark Coil.

Complete Outfit; alternating current generator, headlamps, switch, wire and bulbs.

Easy to install on any car with exposed fly-wheel. No storage battery required. No complicated cut-out nor charging device.

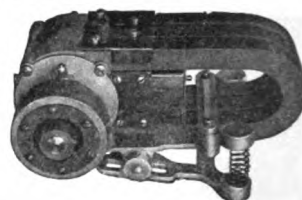
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Weights only 18 lbs. Compare this with the heavy, complicated and costly charging outfits.

This Generator embodies the well-known K-W construction, having no commutator, no brushes, and no sliding contacts, the only moving part being the rotor, which swings perfectly free, supported on high duty ball bearings.

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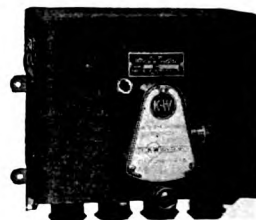
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The New Model LS Lighting Generator, \$20.00.

The K-W Spark Coil

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Because the Master Vibrator does a great deal more than simply replace the four separate vibrators on a coil.

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MORE POWER. It makes the hills "Fade Away."

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SATISFIED FEELING

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The End of Tire Troubles

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When you get tired of swearing at Tire Troubles, try "Bricton" Tire Treads. You'll swear by "Bricton Treads" to the end of your motoring days.

3 Years
29,000 Miles
Not Worn Out Yet

Don't You Want That Kind of Tire Service?

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Department Store.
Dings, Jewels, Hardware, Hosiery Goods and Furniture.
All Kinds of Repairing a Specialty.
Aurora, So. Dak.
July 13th. 1912.

State of South Dakota.,)
County of Brookings.)

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I further declare that during this time I did not experience any tire trouble whatsoever except the replacement of one casing which was in poor condition when the tread was applied.

F. J. Baker



Subscribed and sworn to before me this Sixth day of August 1912.

O. A. Bricton
Notary Public



Send 12 Cents in Stamps for this Picture in Colors.

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That "Bricton" Detachable Tire Treads will save you \$3 out of every \$4 you are now spending for tires.

That "Bricton" Treads are a big success from every standpoint and have been successfully used for several years by thousands of motorists.

That "Bricton" Treads are perfect in service and correct in principle, notwithstanding the "knocks" of tire makers, tire dealers, and others who are envious of our success.

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I want you to see why the Aermore Horn can't clog—why it is self-cleaning. You'll be under no obligation whatever.

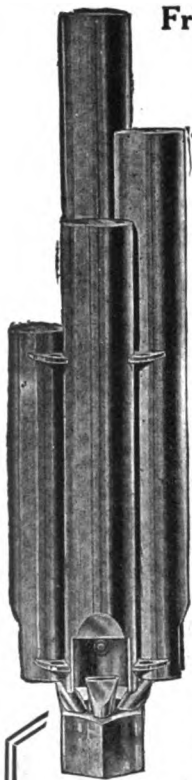
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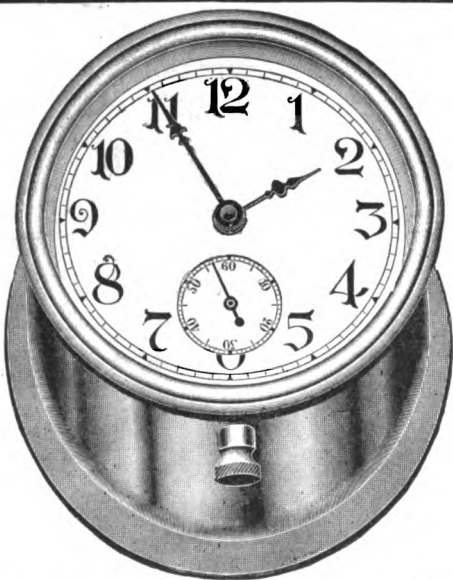
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It has interchangeable parts.

It is the product of skilled labor combined with the most improved Waltham Automatic Machines.

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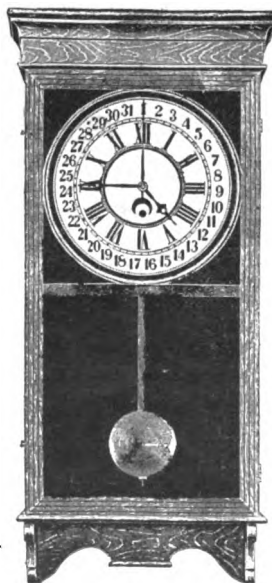
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is the best good fortune any dealer could wish. If you
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STANDARD AIR BAGS are fully guaranteed, so that if after using
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DEALERS—GET OUR SPECIAL OFFER on this money-making guaranteed "SAMSON" Electric Horn

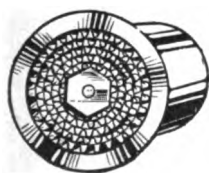


No. 1
Samson Horn
Push and Cord
6/10 ampere at
6 volts.

Cast Brass Base.
Spun Brass Pro-
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12 ft. Cord and
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**STRONG-LOUD
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Saves from 50 to 75% on oil
and gasoline. Gives more
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Give size of intake.

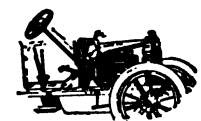
In Cold Weather the **CRONE
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with one crank. No need
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Manufacturer of Primers, Valve
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"A short time ago I sent for and re-
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Price, regular, \$1.75.
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Perfect fitting tire covers that
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Price, regular, \$2.00.
Price, dem. rim, \$2.45.



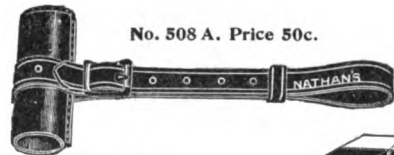
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Top Slip Covers a Specialty.



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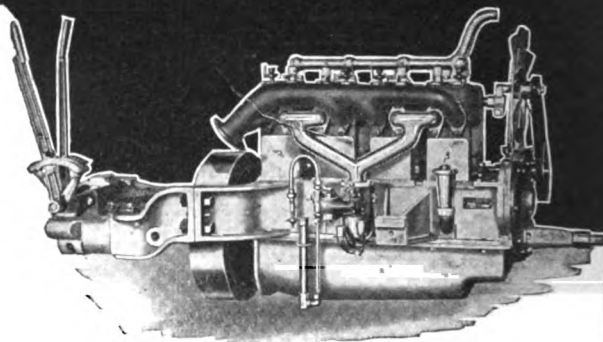
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Give the utmost satisfaction under all possible conditions. They are designed right—made right—they're "all motor."

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From carburetor to flywheel the greatest care is exercised in securing the very highest quality. There is not one weak point about the Model Motor—that's why they have been giving such remarkable service for 18 years. The one big idea in making Model Motors is to produce the most economical power and the greatest amount of it for the weight.



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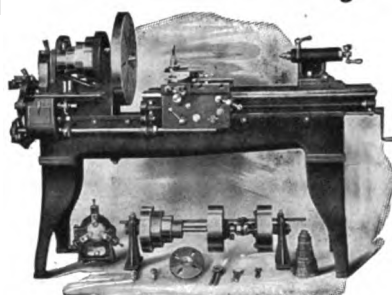


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Wheels Repaired and Returned
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MECHANICSBURG, PA.

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Has 2-15/16 in. spindle with 1-9/16 in. hole thru same. Six quick changes of Geared Feeds, four Step Cone of large diameters.

The 5 1/4 ft. bed takes up to 54 in. between centers, while our 7 1/4 ft. machine takes 96 in. between centers when extended.

Just the thing for garage and repair work, and saves investing in a large expensive lathe.

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Barnes Drill Co., Inc., 1907,
Builders of the All Geared Drill.

The Test of Merit.

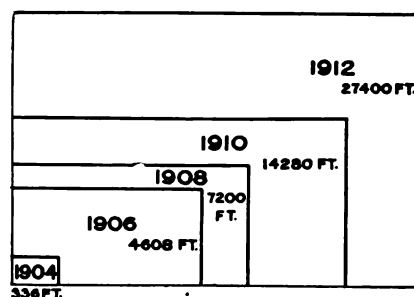
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Starting in 1904 with 336 square feet of floor space and representing an investment of less than \$5,000, it has grown steadily until to-day 27,400 square feet and an investment of over \$100,000 is hardly sufficient for our needs.

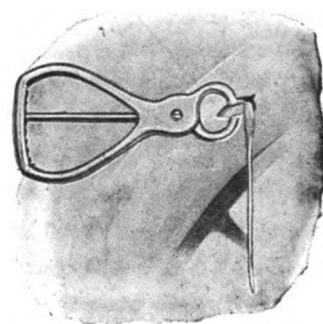


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are as necessary to Car Users as a pocket knife is to you—as useful as a hairpin to a woman. There are 300,000 Car Owners in the United States who KNOW that it pays to repair small cuts in Tires. ARE YOU ONE OF THEM? Hadn't you best write for free copy of "Tire Insurance," or better, send a dollar for a pair of nickel plated PLIERS and combination cleaner and cotter pin hook? They will pay for themselves the first seventy-five miles. They will pay for a set of Tires every 4,000 miles. We guarantee satisfaction.



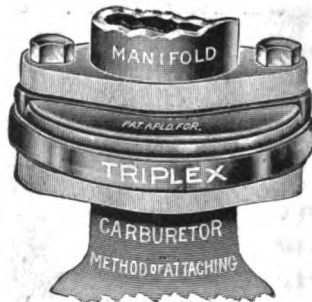
Pliers opened, distending cut for cleaning, tool applying gum. Ratchet in handle holds Pliers open. (Pat.)

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Filbert and 7th Streets

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Promotes Flexibility**

**Makes Perfect Mixture
Prevents Back Firing
Adapted to Any Car**

The Triplex is sold with the understanding that if it does not do as we claim, we will gladly refund your money at the end of 60 days.

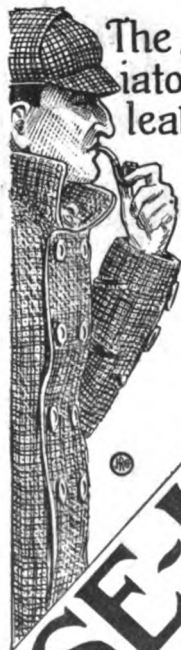
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The great detective of radiator leaks. Finds the leak and fixes it in fifteen minutes.

Stays fixed.

SEMENT-OL

"CHEMICALLY CORRECT"

Modern garages use it instead of solder and tools.

Won't injure metal or clog pipes.

Saves time, money and temper.

Carry it in your car.

Price 75¢ at dealers.

THE NORTHWESTERN CHEMICAL CO.
Marietta, Ohio.

Is Your Auto-Top Showing Wear? You can easily renew and weatherproof it with

"F-S" "Evernew" Auto-Top Dressing

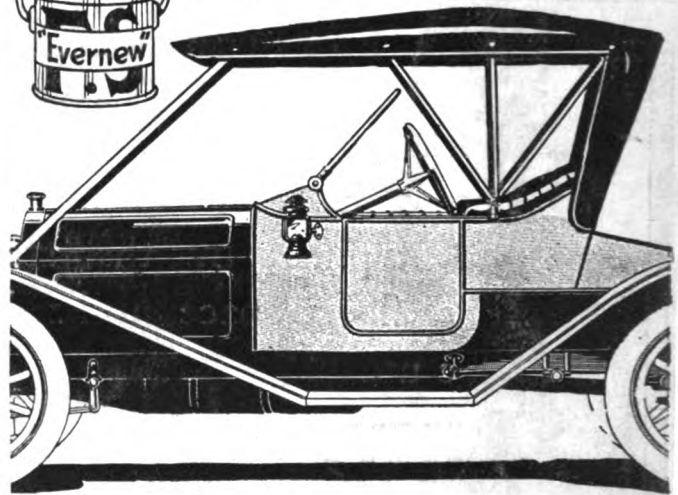
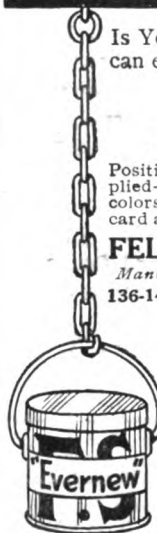
Positively won't injure fabric tops. Easily applied—dries almost instantly. Eight standard colors—special shades to order. Send for color-card and prices.

FELTON, SIBLEY & CO., Inc.

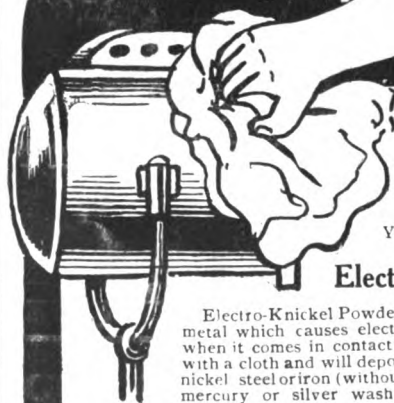
Manufacturers of Colors, Paints, Varnishes,
136-140 N. FOURTH ST. PHILADELPHIA

"Evernew" Auto-Top Sizing for first coat on mohair, cloth or canvas tops that have never been painted.

"Evernew" Auto-Body Enamel in colors to correspond with our "Evernew" Auto-Top Dressing. Special Shades to order.



WHAT'S THE USE?



OF WASTING YOUR ENERGY?

Nickel Plate

Your Automobile Trimmings with

Electro-Knickel Powder

Electro-Knickel Powder contains an electro-positive metal which causes electrolytic action to take place when it comes in contact with water. It is applied with a cloth and will deposit a coat of metal on brass, nickel steel or iron (without a battery). This is not a mercury or silver wash. We guarantee it plates. Price\$1.00

Magic Glass Cleaner for windshields (no rubbing) 15 Cents.

We also manufacture the following special finishes:

Bright Gun Metal Finish. Turns brass or nickel to Gun Metal by chemical action.\$2.50

Dull Gun Metal Finish. Resembles real rubber. Very durable.\$2.00

Glossy Rubber Finish. The only substitute for baked enamel.\$2.00

Each of the above prices includes enough finish to cover all brass parts of car. Full directions for applying. Brass samples sent free of charge.

Express prepaid when cash accompanies order.

Write today for information.

GUN METAL FINISH CO.,

MAIN & WATER STS. DECATUR, ILL.

BOSTON SHOW NUMBER

This Magazine is represented at Space 357, Dept. D, Basement, Boston Automobile Show, March 8-15, 1913

Automobile Dealer and Repairer



A JOURNAL OF PRACTICAL MOTORING

REGISTERED IN U. S. PATENT OFFICE.

THE MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.

Vol. 14, No. 6.

NEW YORK, FEBRUARY, 1913.

Monthly, \$1.00 per year.
Single Copy 10 Cents.

Rapid Roadside Repairs



EASILY TAKEN CARE OF BY

Goodrich Repair Outfits

HERE ARE A FEW YOU SHOULD KNOW OF:

Goodrich P.P.P. Plugs punctures instantly

Goodrich S.V.P. Patches without cement

Goodrich Plastic For cuts in outer casings

Goodrich Rubber Bucket should be in every car

Goodrich Emergency Band and Protector

For first aid in bad blowouts

Horn Bulbs, Repair Outfits, Cements, Patches, Rubber Mats, Gasoline
and Radiator Hose, Pump and Lamp Tubing, Bumpers, etc.

THE B. F. GOODRICH COMPANY, - AKRON, OHIO

BUYERS' GUIDE AND INDEX TO ADVERTISEMENTS, PAGES 76 77 AND 78

The Table of Contents will be found on P

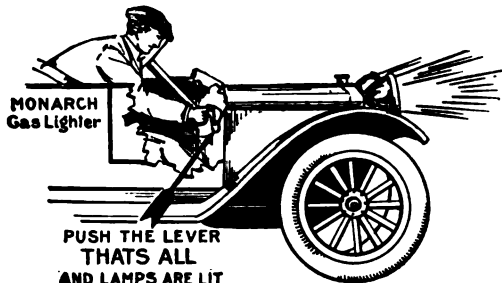
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To Light Your Way

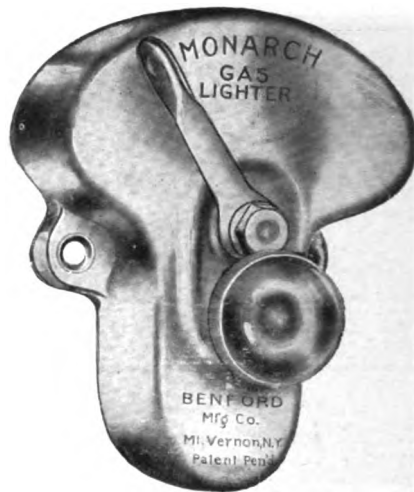
MONARCH GAS LIGHTER

Push the lever once, that's all, and your Gas Lamps are lit. The Monarch Lighter has been so carefully designed and simplified that it is the only Gas Light on the market today that is giving the results the motorist is looking for—The lighting of the Gas Lamps from the seat while the car is in motion.

The main feature, the positive allowance of just the proper amount of gas to give an even flame to the burners, is all accomplished by one motion. Press the lever forward, that's all, and your lamps are lit.



To turn out your lamps without getting out of the car, turn the thumb-screw controlling valve to right and lamps are out. We positively guarantee it impossible to blow off lamps when turning on Gas.

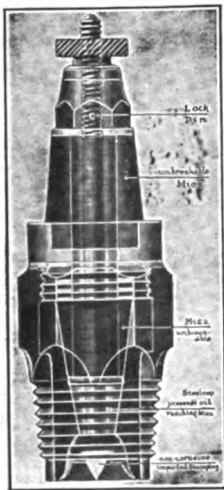


Monarch Lighter furnished complete with best No. 12 ALCO burners, Genuine German Lava Tips, wire, brass tubing, etc., with instructions for attaching in one hour's time.

Price, - - \$6.00

For Ten Years Benford's Monarch Products Have Been Known as the Best

Always a Home Run with a Monarch Spark Plug



ATTENTION!

**A New Extraordinary Offer
Get NEW PLUGS FOR OLD**

Send us your old, worn-out plugs of any make, and for each one of these old plugs we will make you an allowance of 50 cents on the purchase of a NEW Monarch Magneto Plug. Of course this is an advertising plan to introduce our plugs to new users. At this rate you get these at half price.

ONLY 6 PLUGS TO EACH CUSTOMER

BENFORD MFG. CO., 150 Pearl St., Mt. Vernon, N. Y.

GENTLEMEN:—Please send me.....Monarch Magneto Plugs (the \$1.00 kind) in exchange for.....old plugs which we will send you when yours are found satisfactory. On the basis of an allowance of 50 cents for each old plug we enclose \$.....to pay for the new Monarch plugs.

Name.....
Address.....
Size of plugs wanted.....



**MONARCH OIL GAUGE
For Model T Ford Cars**

Takes the place of the lower pet-cock on the transmission case and shows at a glance how much oil there is in the car.
50 Cents

MONARCH TIMERS



For reliability cannot be beat.
Guaranteed for one year.

**2 Cylinder.....\$2.75
3 and 4 Cylinder..... 3.00**
Special short shaft timers to fit, for Ford, Buick and Maxwell.

A Snap For

Ford Owners

4 Genuine Peerless plugs, guaranteed, and our Oil Gauge, \$2.00.

PEERLESS SPARK PLUG

The Best
Hollow Type
porcelain plug
on market.

Special
Magneto Wire
points.

Best Porcelain.



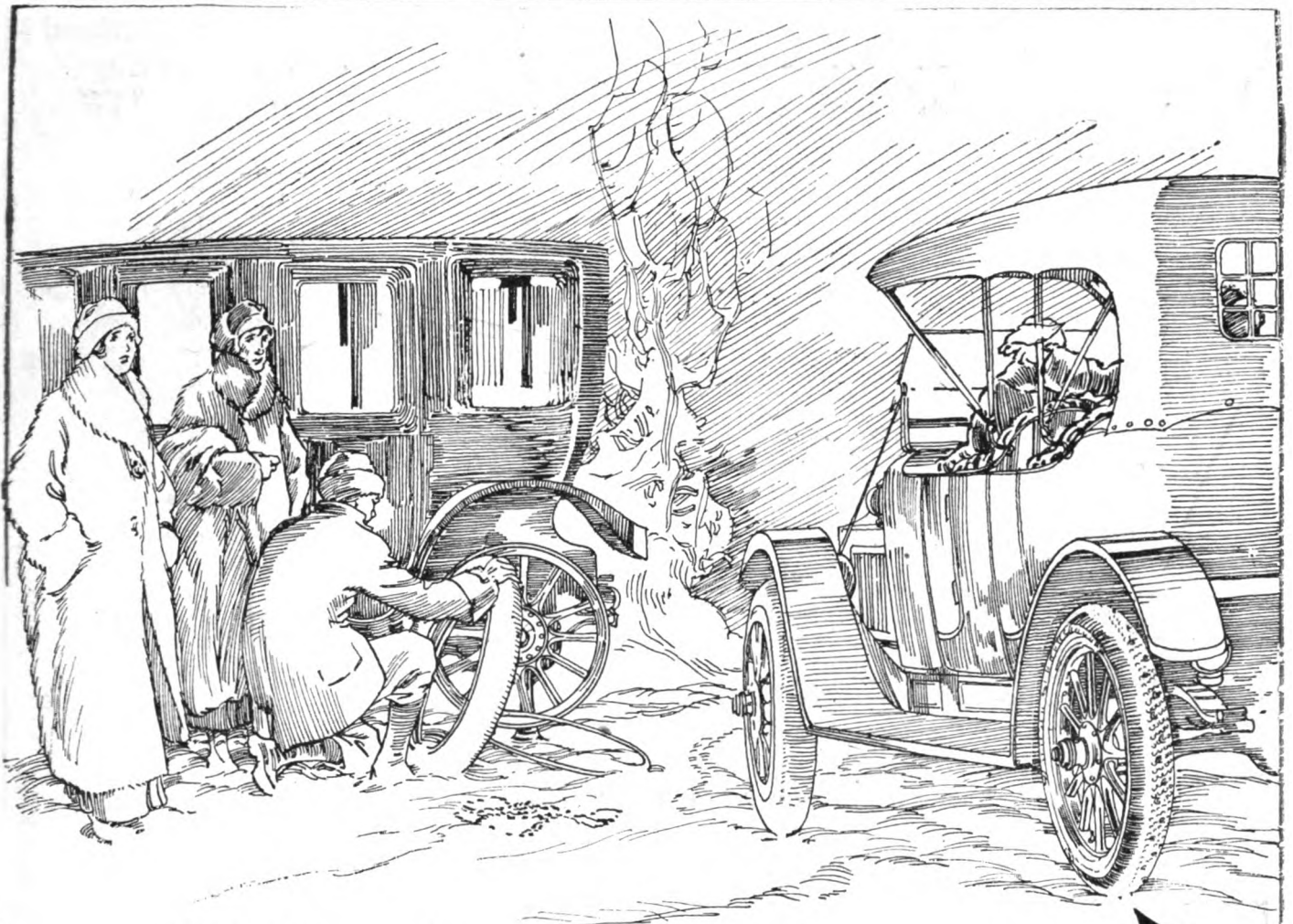
Any not found satisfactory after six months will be replaced Free.

50c. each

BENFORD MFG. CO.,

130 PEARL STREET

MT. VERNON, N. Y.



Skidding Insurance *plus* Puncture Protection

It is not necessary to invite punctures and frostbitten fingers in order to give your tires traction in snow and ice. It is not necessary to stop on reaching a bad spot in the road to put on nod-skid devices. It is not necessary to accept shortened tire life as the price of security.

Woodworth Treads

are a permanent insurance against both skidding and punctures. They are always on the job; they enable their owner to drive on the worst roads with the same security as in midsummer; they enable him to forget tire troubles, because he has none.

Best of all, they earn much more than their cost by prolonging tire life and reducing tire charges per mile. In the final reckoning, they cost **less than nothing**.

Unlike protectors fastened to the rim, Woodworth Treads are always snug, because their stiff side springs automatically take up all stretch. They cannot chafe or cause injury if the tires are properly inflated.

Start the season right by protecting your new tires from wear and punctures. Woodworth Treads are fully guaranteed. If your dealer does not carry them, write to-day for full particulars.

LEATHER TIRE GOODS COMPANY, Niagara Falls, N. Y.
NEW YORK STORE: 1608 Broadway

Good Agents Wanted for Unoccupied Territory

"Double Grip"
Woodworth
Treads, for use on
snow and ice. The
high rivets are cupped and
hardened, and can be re-
newed.



ADD \$10 TO \$20 PROFIT TO EACH AUTOMOBILE SALE

Here's an easy way to pick up an extra Ten or Twenty Dollar Bill whenever you sell an automobile.

Just send us the name of the purchaser and we will endeavor to sell him an Edwards Private Portable Steel Garage.

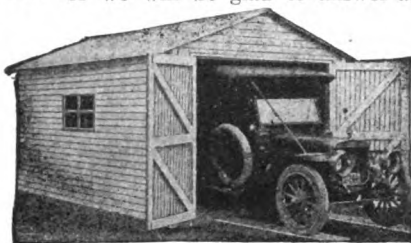
That's all we want you to do—merely furnish us the name.

You Invest No Money or Time

It means \$9.25 to \$20 profit **FOR YOU** on each sale. And you've no **money** or **time** invested. Send us a list of all automobile owners in your locality, and on this plan you'll make a nice, clean profit—perhaps several hundred dollars.

The Edwards is far and away the most popular and widely advertised Private Garage. Our prices are much lower than others. And we've an excellent system of following up all names received. We won't miss any opportunities to close sales.

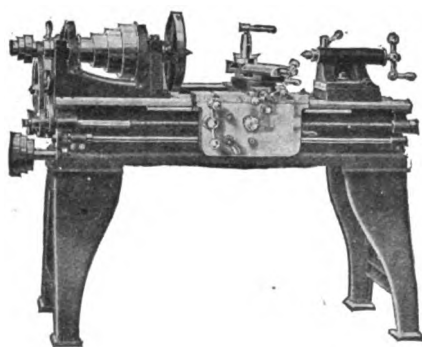
Write Us Now Send us your list of local auto owners at once, or we will be glad to answer any questions.



Edwards Fire-Proof Garage

An artistic, fire-proof steel structure for private use. Gives absolute protection from sneak thieves, joy riders, fire, lightning, accidents, carelessness, etc. Saves time, work, worry and trouble. Comes ready to set up. All parts cut and fitted. Simple, complete directions furnished. Absolutely rust-proof. Joints and seams permanently tight. Practically indestructible. Locks securely. Ample room for largest car and all equipment. Made by one of the largest makers of portable fire-proof buildings. Prompt, safe delivery and satisfaction guaranteed.

The Edwards Mfg. Co., 723-773 Eggleston Ave., Cincinnati, O.

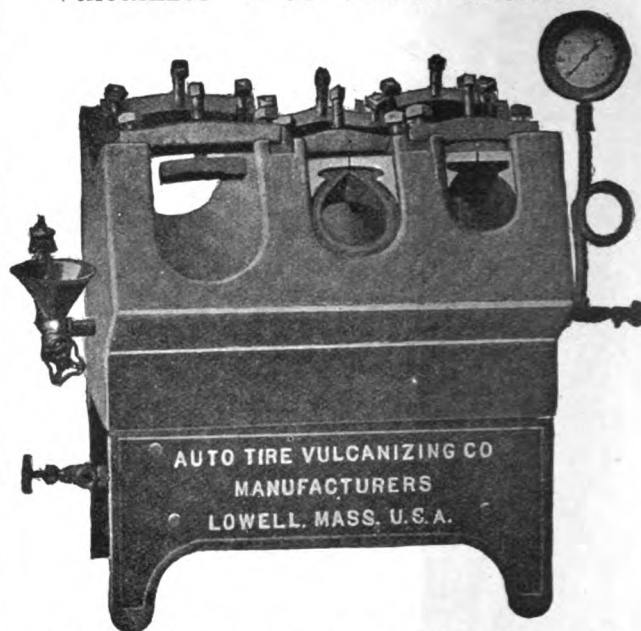


DO YOU KNOW why there are more
SEBASTIAN LATHES used in Gar-
ages and
Automobile Repair Shops than any other
make?

We haven't the space to tell you why but we have a new catalogue which will tell you all about it and we will be glad to send you a copy free.

THE SEBASTIAN LATHE CO.,
108-110 Culvert St., CINCINNATI, O.

Our New No. 8 Adjustable Sectional Vulcanizer With Three Cavities



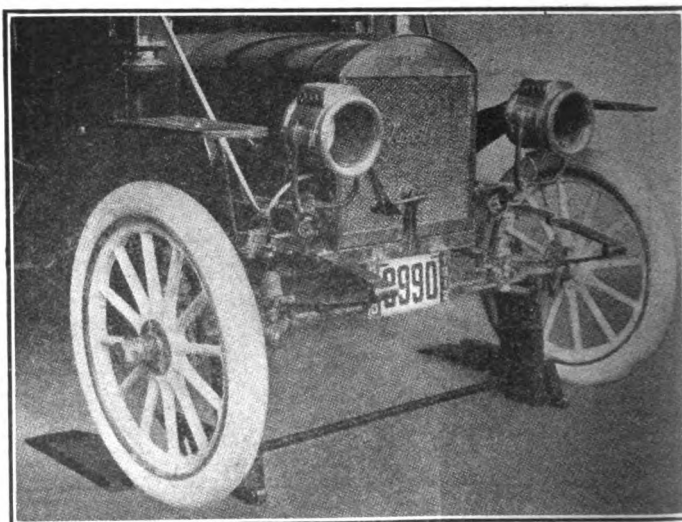
As a Progressive Business Man you should by all means use, handle or recommend our

New Improved Auto-Tire VULCANIZING MACHINE

simply and solely because it is the best there is in Vulcanizers at any price and because the price isn't much, the operation is easy and profits are exceptionally large.

Our machine is different, far better and more economical in operation and investment cost than any other made. In all features it is so superior to all other devices there is hardly a comparison. We have some facts that will interest you and that will put you in the way of big profits. In your own interest, get posted—Write to us to-day.

Auto-Tire Vulcanizing Co., Lowell, Mass.



SAVE YOUR TIRES BY USING

HART'S Automatic Adjustable Auto-Jack

Send for Catalog A. **AGENTS WANTED.**

For circulars telling you all about it ADDRESS

C. A. HART,

Patentee and Manufacturer, 520 N. Main St., Findlay, O.

It means **MONEY** to you, Automobile Owners!

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Guaranteed 5000 Miles Without Puncture

Even Over the Roughest Frozen Roads

Your tire expenses this winter will be tremendous. Icy, frozen roads will cut and puncture them if they are not protected by **Durable Treads**.

If your tires are protected by **Durable Treads** you can travel over the most disastrous frozen roads, with never a fear of puncture, cut or blow-out. You will experience no unpleasant road delays—your tire bills will vanish.

On slippery pavements—in crowded streets—you can control your car. For there will be no slipping or skidding with **Durable Treads**. There will be no need for ruinous, inconvenient chains.

Our Written Guarantee

With **Durable Treads** we will give you a written legal guarantee for 5000 miles without puncture. This is binding whether your tires are new or old, tread-worn, rim-cut or rut-worn.

Durable Treads are the only treads built to protect your tires against rim-cuts, rut wear and side blow-outs.

The full leather cover prevents gravel and sand from entering, to grind and wear the tire.

With **Durable Treads** the resilience of your tires is just as great—high speed just as easy—cost of gasoline no more.

Construction

1.—Extra heavy tread strip covers wearing surfaces, adding 50% to the life of protector.

2.—Three to five plies of Tire Fabric prevents stretching or sagging.

3.—Hardened Steel Rivets, closely set on Tread surfaces, prevents skidding.

This is perhaps the most liberal guarantee ever given with a tread. Read it over again! Get its full meaning to you! Figure out what it will save you each season.

We are able to give you this guarantee in black and white—binding—bona fide—because **Durable Treads** every day, on thousands of cars, are proving that they can make good. This is because **Durable Treads** are different, absolutely, from all others.

Your Annual Problem Solved

Each season you are face to face with the same old problem—new tires. Each season you must pay \$50 to \$200 for a new set.

But this problem can be solved through **Durable Treads** at half the cost of tires. If your tires are now worth keeping—unless they are shot to pieces—**Durable Treads** will make them wear 5000 miles more without puncture.

So do not abuse them another day—do not run them unprotected until they are useless—or you'll throw away \$50 to \$200.

If your tires are new, **Durable Treads** will save them—give you three seasons wear instead of one.

Construction

4.—Full leather cover protects tire against ruts and blow-outs.

5.—Nickel Steel Rim attachment places driving strain on wheel, instead of on worn, weakened tire. It also prevents rim-cuts and blow-outs.

Durable Treads

Tire Expense Reduced Half

Your tire expense is now actually 1½ to 4 cents per mile. It is greater than that of gasoline and oil combined. Yet it can be eliminated through **Durable Treads**. For with **Durable Treads** punctures, blow-outs and tire repairs will be eliminated.

If you'll stop to figure out what that means, you'll find that you spend enough on repairs alone each season to almost maintain your car.

Forcing Recognition!

Every day the list of **Durable Treads** converts are growing. And only because **Durable Treads**, through their remarkable advantages—are forcing that recognition. Car owners are awakening to the fact that they can save that 1½ to 4 cents per mile.

The cry we have always heard about tire expense is becoming fainter. This season our sales are doubling month by month. For our owners now realize that **Durable Treads** are not an experiment, but a proven quantity—a most vital factor in automobile construction. They should soon become part of the standard equipment.

Cost Half Of Tires

A set of tires costs \$50 to \$200. But **Durable Treads** cost less than half that. Hence, isn't it more economical to protect these costly, delicate tires? Isn't it more economical to buy **Durable Treads**, at half the cost of tires, than to buy new tires each season? **Durable Treads** are a leather and canvas cover—studded with steel rivets—that covers the entire tire, just as it stands on your car.

Test At Our Expense

We want you to know just what **Durable Treads** are before you invest a cent or promise to buy. We will ship you a pair or full set, with your permission, for inspection. We pay all express charges—you are not put to a cent's expense, obligation or trouble. You make no promises to buy. After you examine **Durable Treads**, if you are not satisfied that they will do all we claim, return them. This examination will cost you nothing.

Special Discount

If **Durable Treads** are not already represented in your territory, we will make shipment to you direct from the factory and allow you our full dealers' discount on your initial order. This is merely to introduce them. It is an excellent opportunity for you to equip your car at almost cost. It must be taken advantage of immediately, for the inquiries and orders each day are rapidly filling all territories.

Send Coupon For Facts

We have explained to you without exaggeration just what **Durable Treads** will do! We have shown you how to save \$50 to \$200 each season. Now we want you to send the coupon to us at once for copy of our legal guarantee and other conclusive proofs. We will send you a sample of **Durable Treads** leather. If you can rip it, you must be unusually strong. Simply fill in and mail the coupon—but be quick!

Address nearest office.

COLORADO TIRE & LEATHER CO., 1208 Majestic Bldg., Chicago, Ill.; 1348-D Acoma St., Denver Colo.
528-D W. 34th St., New York City; 435-D Golden Gate Ave., San Francisco, Cal.

COLORADO TIRE & LEATHER CO., 1208 Majestic Bldg., Chicago, Ill.; 1348-D Acoma St., Denver, Colo.
528-D W. 34th St., New York City; 435-D Golden Gate Ave., San Francisco, Cal.

Dear Sirs:—Please send me at once, without obligating me, sample of **Durable Tread** leather, booklet, copy of guarantee, price of **Durable Treads** and special discount offer.

Name.....Street Address.....
City.....State.....
My Tire Sizes are.....

This is what will happen to your tires this winter.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



FORD OWNERS

WE HAVE BEEN SPECIALIZING ON FORD NECESSITIES FOR FOUR YEARS AND FOR 1913 WE OFFER YOU A LINE THAT WILL APPEAL TO YOU. THE GOODS ARE GUARANTEED SATISFACTORY AND WILL BE SENT PREPAID ON RECEIPT OF PRICE IF YOUR DEALER DOES NOT CARRY THEM.

AUTO PARTS Co., (BOSTON SHOW, Space 411,) **Providence, R. I.**

OIL GAUGE

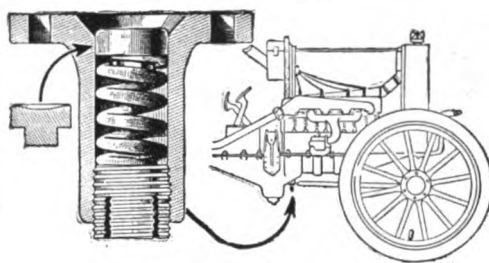


You must know that the proper height for the oil is about one-half inch above the bottom pet-cock and if you have it up to the top pet-cock it is two inches too high, and you are wasting oil and gumming up your motor. If you try to keep the oil at the right level you will have to put oil in every twenty miles and then take a chance of burning your bearings out. If you have the right amount of oil at all times your car will not smoke, the plugs will not soot, the valves will not pit, and the motor will not carbonize. There is only one way to keep the oil right. Use an APCO Oil Gauge. The gauge can be put on your car in ten minutes with a pair of pliers, simply remove lower pet-cock and thread gauge in its place. A great convenience and absolute insurance against burned-out bearings.

Price, 75 Cents

ANTI-RATTLING BALL SOCKET

PATENTED 1912



Extending from the front axle of the "T" Ford back towards the rear, is a triangle shaped tube or torsion rod with a ball on the end where they come together.

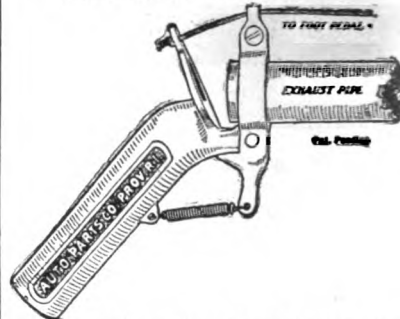
This ball fits into a socket on the bottom of the engine case and is held in place by a steel cap. When the ball wears a little, it has a tendency to rattle and if the cap is taken off, and filed down too much, the ball will be cramped and break off in going over rough roads.

The APCO Socket takes the place of this steel cap, and once installed on the car it requires no further attention as the heavy spring automatically takes up the wear.

To apply the APCO Socket, simply remove the cap now on the car and replace with ours.

Price, \$3.00

EXHAUST WHISTLE

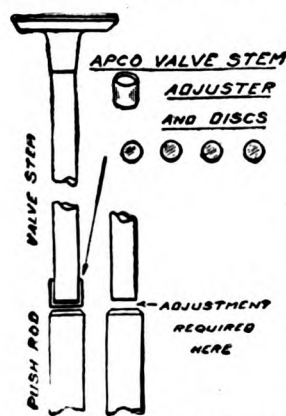


Undoubtedly you have often felt the need of a long distance warning signal that could be operated without removing your hands from the steering wheel, and for 1913 we offer the APCO Exhaust Whistle that has made good on thousands of cars all over the country during the past four years. The device is very simple, weighs a pound and can be put on your car in half an hour. There is nothing to get out of order, no back pressure, and it positively will not clog up, as no part of the Whistle comes in contact with the exhaust gases except when the Whistle is in use (most other Whistles are always in contact with the gas and therefore they are clogged up and inefficient half the time).

Remember the APCO Whistle is not a musical instrument but a producer of real noise that will make the teamsters "sit up and take notice." Made for 1 1/4", 1 3/4", 1 1/2", 1 3/8", 1 1/4" pipes back of muffler, and is furnished complete ready to attach, including brass pedal, cable and screws.

Sizes to 1 1/4" \$3.50 Sizes above 1 1/4" \$4.00
Half the price, twice the noise.

VALVE STEM ADJUSTERS



If you do not keep your valve stems adjusted properly your car will lose power, and as the valves are intended to open at a certain time, even a fraction of a second means a great loss. The valves on a Ford car open about 3/8 of an inch and if there is 1/8 of an inch play between push rod and valve stem the valve only opens 1/8 of an inch, or in other words you lose one-third of the power. Still another thing to be considered is the noise caused by this play and ninety per cent. of motor noises arise from this source (note the quietness with which the large cars run, due to the fact that the push rods are adjustable).

The APCO Valve Stem Adjusters consist of hardened caps made from Jessops steel and a quantity of very thin hardened steel discs. To apply the Adjusters all that is necessary is to raise the valve slightly and slip

an Adjuster on the end, and if this is not sufficient put enough discs in the cap to reduce the play to the thickness of a piece of newspaper. The whole set can be put on in less than an hour and wear can be taken up very easily by inserting discs.

All the high priced cars have an adjustment, and if our price was \$10.00 you could not afford to be without them. State model and year of car or diameter of valve stems when ordering. Made in three sizes, 5-16", 3/4", 7-16". For Model T Fords we recommend the size 7-16" as they fit on the push rods of this car and do not have to be removed when grinding valves.

Set includes eight adjusters and a quantity of discs to take up wear as occasion requires.

The price is nominal, the improvement phenomenal.

Price, \$1.50

VALVE GRINDER

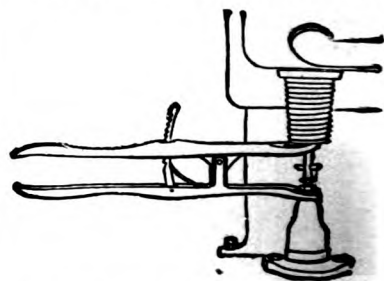


This tool was designed to meet the demand for a simple and efficient valve grinder for these cars and the sale that it has had shows us that it fills the want.

There are other grinders on the market but this is the only one that will fit under the dash on the last valve of the "T" Ford. Leaky valves are the source of most motor trouble and if your valves are not tight you are losing power. You will be surprised to see how easy it is to grind your valves when you once try and you will save enough the first time to buy two grinders. Made from gray iron, nicked and highly polished.

Price, \$1.00

VALVE SPRING REMOVER



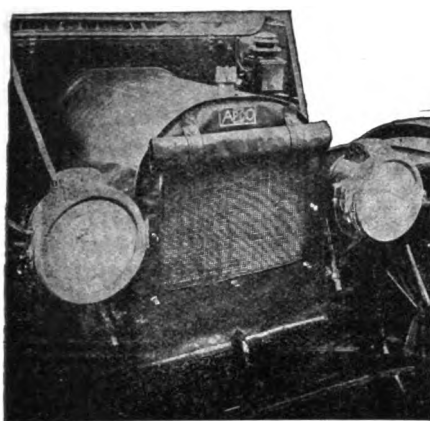
Did you ever try to remove the valve springs on your car with a screwdriver? And did the screwdriver slip and let the spring down on your finger? The APCO Valve Spring Remover is without question the best device on the market for this purpose and it will do anything any Remover will do and a lot easier. It is very simple in construction, made from malleable iron, nickel plated. Can be operated with one hand leaving the other free to remove pin, and valve can be ground with Remover in position. Don't catch your fingers again.

Price, \$1.00





HOOD COVER



This is one of the best winter specialties we have ever offered and it cannot help but meet with the approval of the Ford owners.

The cover is made from rubber cloth, well stitched and padded with felt.

It completely envelops the hood and radiator.

It keeps in the heat, working on the same principle as a "fireless cooker" or a "vacuum bottle."

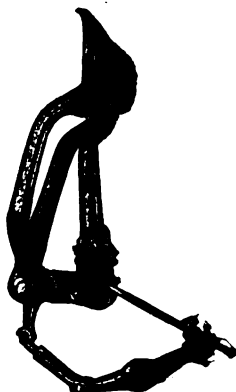
With one of these covers on, your car will not cool off over night and therefore it will start without trouble in the morning.

It is absolutely waterproof and it can be left on the hood all winter, protecting the engine from rain and sleet as well as the cold.

When running the front curtain should be fastened up, and let down when car is standing.

Price, \$5.00

CLUTCH RELEASE



A simple device that automatically releases the clutch on the Model "T" Ford when the foot brake is applied. Pressure on the brake pedal releases the clutch *before* the brake is applied and if you wish to coast you simply push the brake pedal forward, which releases the clutch, and pushing the brake pedal farther forward applies the brake and brings the car to a standstill without the use of the emergency brake or the clutch pedal. In reversing, the foot is always on the brake pedal to stop the car instantly without stalling the engine. Applying the brake without first throwing out the clutch wears the brake out quickly and puts a strain on the clutch that will cause it to slip after a few weeks' use.

Price, \$1.00

FOLDING BRASS ROBE RAIL



Especially designed for the Model "T" Ford Touring Car. The only one on the market that will fasten to the back of the front seat on the 1911, 1912 and 1913 Ford Cars.

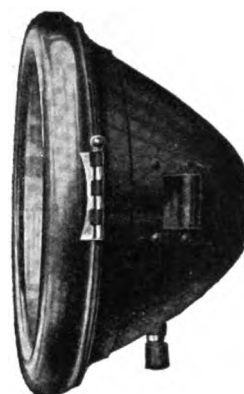
Price, \$1.50

MAGNETO LIGHTING OUTFIT No. 8

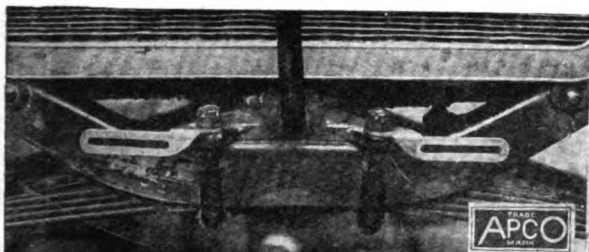
Our 1913 No. 8 Lighting Outfit will have 11-inch lamps instead of 8-inch and they will be finished in brass and black enamel, and are exactly the same as used on the high-priced electric equipped cars.

The lamps alone are worth \$25.00 a pair and we will sell the whole outfit for \$15.00, complete with everything to equip your Ford Car.

Price, \$15 00



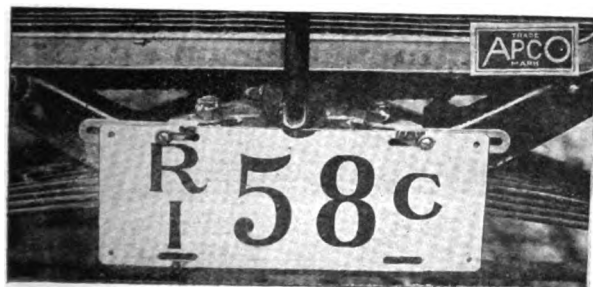
FRONT NUMBER HOLDERS



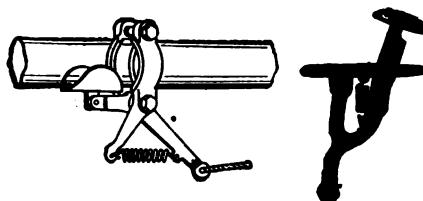
Here is something new in a Front Number Plate Holder for the Ford Car. It is Better and Cheaper than any other on the market.

The set consists of a pair of steel (rust proof) brackets that bolt to the front spring clips of the "T" Ford. They hold the plate out of the mud and prevent all rattle. Put on in two minutes. Will last years. Complete with screws, washers, nuts, etc., ready to install.

50c. per set, front only



MUFFLER CUT-OUT



Our 1913 Cut-out is the same design as our earlier type, but is made from malleable iron and guaranteed not to break, and with it we furnish a solid brass lock-open pedal that will hold the Cut-out open without holding your foot on the pedal. Our Cut-out is efficient, simple and easy to install. Absolutely positive in action and will prevent bursting of muffler; will increase the power of the engine, and easily locate skips. To attach, cut $1\frac{1}{2}$ in. hole in exhaust pipe and clamp Cut-out in place, fasten pedal in floor board and connect with Cut-out by cable furnished. There is no question about a Cut-out being a good thing and at our price you cannot afford to be without one. Including cable, brass lock-open pedal, screws, etc., ready to attach.

Price, \$1.50

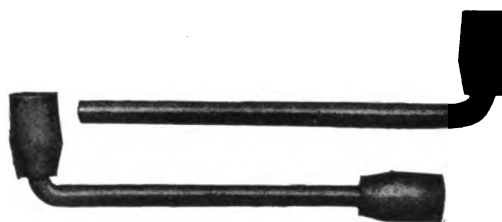
MAGNETO LIGHTING OUTFIT No. 2

This is the same outfit that sold so well last year and it consists of two heavy silver plated reflectors, with bayonet socket for lamps, two genuine tungsten bulbs, twelve feet best wire, switch and everything to convert both lights from gas to electricity.

Do not throw away your gas lights if you are satisfied with their appearance, as this outfit will give you all the light you need, and the cost is low.

Price, \$6.00

CYLINDER HEAD BOLT WRENCH



These wrenches are made from high grade steel instead of cast iron and are guaranteed to withstand the most severe service. The double wrench is the same size as the other but a little more convenient to handle as the bolt can be started with one end and unscrewed with the other.

Price on single wrench, 40c., and double, 60c.

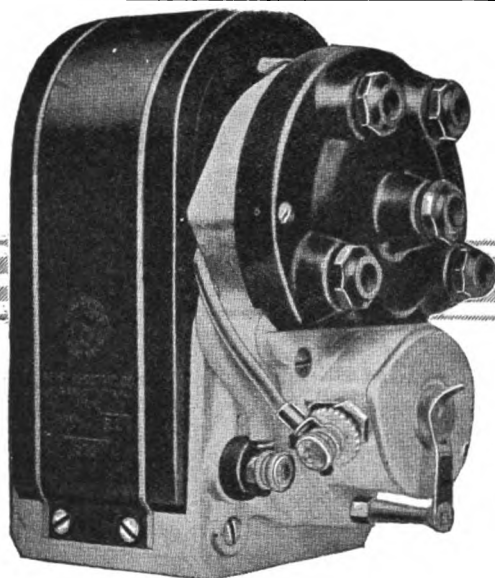
VALVE ENCLOSURES.....	\$3.50
REAR AXLE TRUSSES.....	3.00
TIRE COVERS (Both Size).....	2.00
FORD 1911 TIMERS.....	2.50
SIDE AND REAR TIRE IRONS.....	4.00
ALUMINUM HEEL REST.....	1.00
FAN BELTS.....	.60
MASTER VIBRATORS.....	7.00

FREE

With every purchase we will send absolutely free of charge a set of Number Holders for your car. Simply mention this paper.

AUTO PARTS CO. - Providence, R. I.





Remy

Magneto

Chosen by America's leading manufacturers

More Remy Magnetos are being used on 1913 American Automobiles than all other makes combined.

Our contracted sales for 1913 are Five Times Greater than in 1912. We ship over 13,000 Remys monthly.

THE greatest aggregate board of automobile engineers in the world recommends the use of the new Remy Magneto. This is an expression of the confidence of this country's foremost manufacturers in Remy Magnetos and the facilities of the Remy plant in Anderson, Indiana. It means that factory heads, responsible for returns from financial investments totaling one half billion dollars, put their stamp of approval on the new Remy Magneto. These men are ready to trust their entire 1913 productions and business reputations to the performance of the new Remy.

And these builders in making their choice consulted more than 10,000 automobile dealers throughout the United States. They, too, approved the Remy.

Each of these groups of engineers, manufacturers and dealers feel secure in buying Remy

quality. The engineers know the Remy stood their punishing tests; the manufacturers know the Remy from its inception; the dealers know the Remy as having made good on more than 300,000 cars during the last 15 years. All of these groups know that the Remy is the simplest ignition device made; that this simplicity is backed by Remy Magneto Service for Users, Dealers and Manufacturers.

There are more than fifty Remy branches and service stations located in North American motoring centers for intelligent service to Remy users.

See that a new Remy is on the car you buy.

We have published a simple explanation of magnetos in general and Remys in particular. It is written so that a school boy can understand it. Copy to you on request.

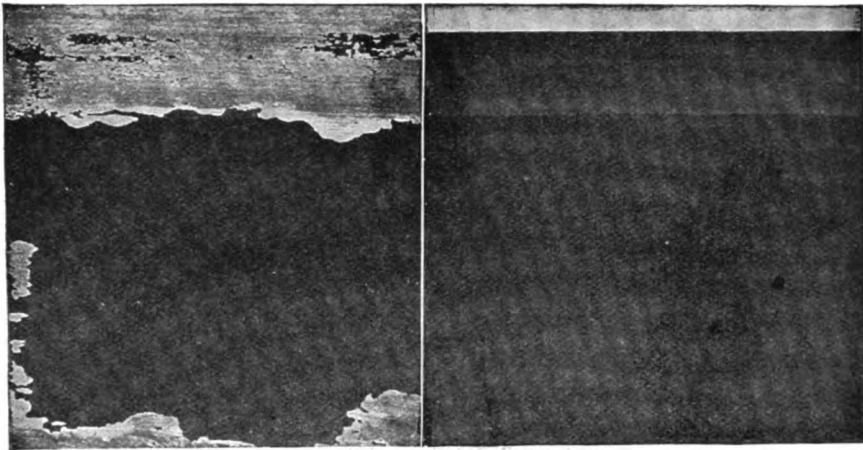
Exchange your old magneto (any make) for a new 1913 Remy; it will cost you practically no more than repairs on your present ignition system.

The Remy Electric Company, Anderson, Indiana

Service Stations:

Anderson, Ind.	Charlotte, N. C.	El Paso, Texas.	Memphis, Tenn.	Philadelphia, Pa.	Savannah, Ga.
Albuquerque, N. M.	Chicago, Ill.	Grand Rapids, Mich.	Milwaukee, Wis.	Pittsburgh, Pa.	Seattle, Wash.
Atlanta, Ga.	Cincinnati, Ohio.	Houston, Texas.	Minneapolis, Minn.	Portland, Me.	Spokane, Wash.
Baltimore, Md.	Cleveland, Ohio.	Indianapolis, Ind.	Nashville, Tenn.	Portland, Ore.	St. Louis, Mo.
Birmingham, Ala.	Columbus, Ohio.	Jacksonville, Fla.	New Orleans, La.	Providence, R. I.	Syracuse, N. Y.
Boston, Mass.	Dallas, Texas.	Kansas City, Mo.	New York City, N. Y.	Rochester, N. Y.	Utica, N. Y.
Buffalo, N. Y.	Denver, Colo.	Los Angeles, Cal.	Norfolk, Va.	San Antonio, Texas.	Washington, D. C.
	Detroit, Mich.	Louisville, Ky.	Omaha, Neb.	San Francisco, Cal.	

Canada—Vancouver, B. C.; Calgary, Alberta.; Montreal, Que.; Winnipeg, Man.; Hamilton, Ont.; Toronto, Ont.



Insure the Quick Job With Celox Sealer

This photograph of a test panel, after exposure to the weather for several months, shows most graphically the value of our Celox Sealer in automobile and carriage painting.

It is a wonderful material for use with any system—it is *absolutely essential* for good results with any *quick* system of painting.

The panel was finished with our Celox Quick System—the only difference between the two halves being the use of a coat of Celox Sealer over the last coat of surfacer on the right hand half.

It will be seen that the Celox Sealer means the difference between the failure of the job and its complete success. Our Celox Quick System, with the Celox Sealer, is the quickest of all systems of high grade automobile and carriage paint-

ing. It saves many hours of drying time and many hours of labor on every job.

The Sealer thoroughly permeates the surface, imparts to it toughness and elasticity, and effectively seals its more or less porous surface. This prevents the penetration of moisture during washing and wet weather and thereby eliminates all flaking and peeling, and furthermore provides a perfect non-absorbent foundation which prevents the sinking in of subsequent coats of color and varnish.

Most quick systems have failed because quickness was their only good feature. The Celox Quick System is fortified with Celox Sealer and successfully combines time and labor saving with durability.

Write for booklets and comparative cost sheet of Celox Quick System.

Valentine & Company,

456 Fourth Avenue
NEW YORK

343 S. Dearborn Street
CHICAGO

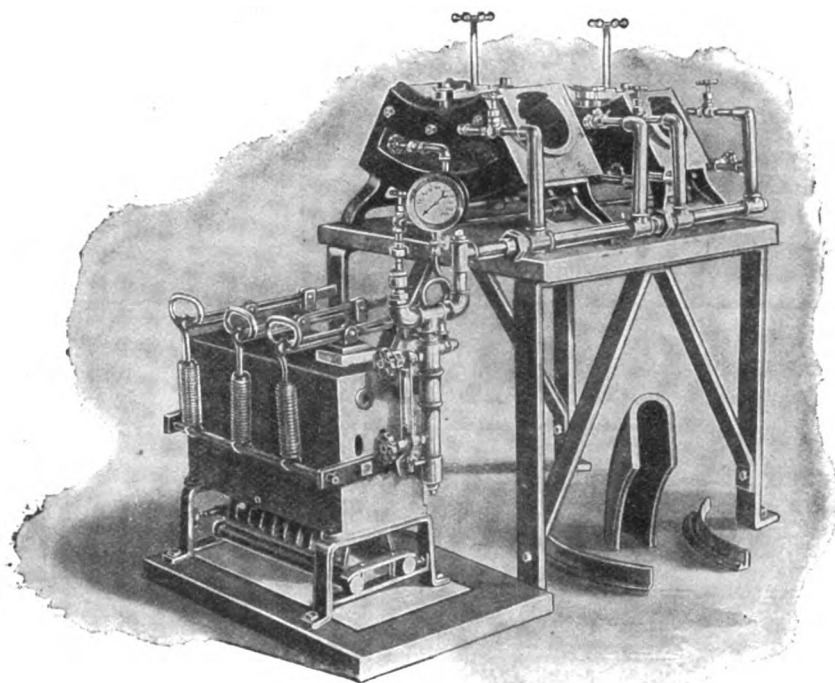
74 Pearl Street
BOSTON

TRADE **VALENTINE'S** MARK
VARNISHES

FILL IN, TEAR OFF, MAIL TODAY—
VALENTINE & COMPANY, 456 Fourth Ave., N. Y. City.
 NAME.....
 ADDRESS.....
 Please send me Booklet and
 Cost Sheet of
 Celox Quick
 System.

Forty Million Dollars For Tire Repairs

The 1,200,000 cars in use in 1913 will necessitate spending at least \$40,000,000.00 per year for tire repairs. At least six million tires will be used. Every 200 cars will produce at least \$6,000.00 worth of this business which carries an average profit of 40%.



No. 5. EQUIPMENT FOR GAS OR GASOLINE.

We have many other outfits, both self steam generating and for an independent boiler.

YOU OUGHT TO SHARE IN THE PROFITS. Install an Akron-Williams outfit, the kind used and recommended by twenty-seven out of thirty tire makers and by successful repair men everywhere. Ask your tire maker about us.

IT DOESN'T TAKE MUCH MONEY to buy the best plant and you can make more with it than with an investment four times as large in any other line. We have outfits from \$40.00 to \$1000.00, depending upon how much and what range of work is to be handled. Every outfit is standard.

GET INTO THIS PROFITABLE BUSINESS NOW.

Write Today for Catalogue 121.

"IF IT IS USED TO REPAIR TIRES, WE MAKE IT."

THE WILLIAMS FOUNDRY & MACHINE COMPANY

GLENDAL AVENUE . . . AKRON, OHIO

This Is The Way They Swear by "BRICTSON" Detachable Tire Treads

When you get tired of swearing at Tire Troubles, try "Bricton" Tire Treads. You'll swear by "Bricton Treads" to the end of your motoring days.

3 Years
29,000 Miles
Not Worn Out Yet

Don't You Want That Kind of Tire Service?

The End of Tire Troubles

The End of Excessive Tire Expenses

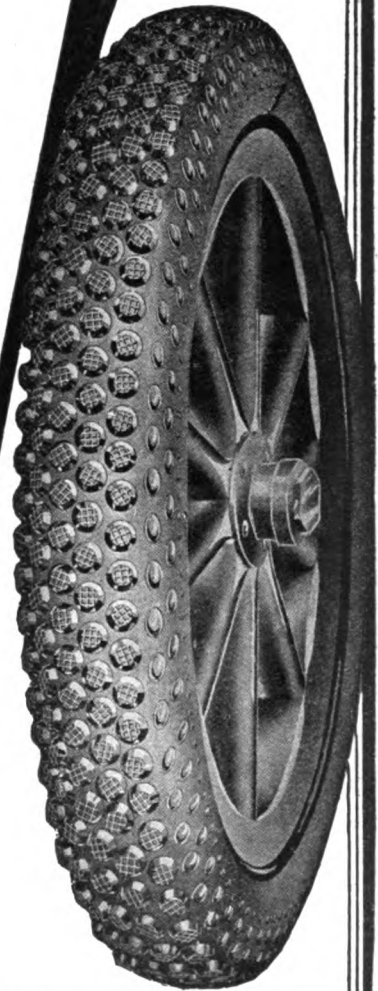
F. J. Baker
Department Store.
Diamonds, Jewelry, Hardware, Hainess Goods and Furniture.
All Kinds of Repairing a Specialty.
Aurora, So. Dak.
July 13th. 1912.

State of South Dakota.)
County of Brookings.)
I, Fred Baker, a Merchant of Aurora, So. Dak. being duly sworn, do dispose and declare on oath that during the year of 1909 I purchased a complete set of "Bricton" Detachable Treads which I have used continually for 3 years and during that period have travelled more than 29,000 miles. Three of the original rubber casings and inner tubes are still on the car and in good condition, having never been off the car for repairs and from all appearances look good for 10,000 miles more.
I further declare that during this time I did not experience any tire trouble whatsoever except the replacement of one casing which was in poor condition when the tread was applied.

F. J. Baker

G. O. TRYGSTAD
NOTARY PUBLIC
SOUTH DAKOTA

Subscribed and sworn to before me this Sixth day of August 1912.
G. O. Trygstad
Notary Public



Send 12 Cents in Stamps for this Picture in Colors.

We Can Prove To You—

That "Bricton" Detachable Tire Treads will save you \$3 out of every \$4 you are now spending for tires.

That "Bricton" Treads are a big success from every standpoint and have been successfully used for several years by thousands of motorists.

That "Bricton" Treads are perfect in service and correct in principle, notwithstanding the "knocks" of tire makers, tire dealers, and others who are envious of our success.

If you want to make a discovery that will show you a great light on the tire question, just sign and send in one of the coupons. No obligation, no expense, but just a little "education" that will save you hundreds of dollars for the balance of your motoring days.

O. A. BRICTSON, Pres.

The Bricton Mfg. Co.
Brookings, S. D., U. S. A.

← TEAR OUT →

O. A. Bricton,
Pres.

The Bricton Mfg. Co.
Bricton Bldg., Brookings, S. D.

Without obligation on my part send me your Exclusive Agency Proposition, 1913 Catalogue and Dealer's Folder.

Name

City..... State.....

County.....

O. A. Bricton,
Pres.

The Bricton Mfg. Co.
Bricton Bldg., Brookings, S. D.

I am interested and would like to know more about your booklet "The Enemy of Tire Expense," Proofs from Automobile Owners, Prices, Etc.

Size of Tire.....

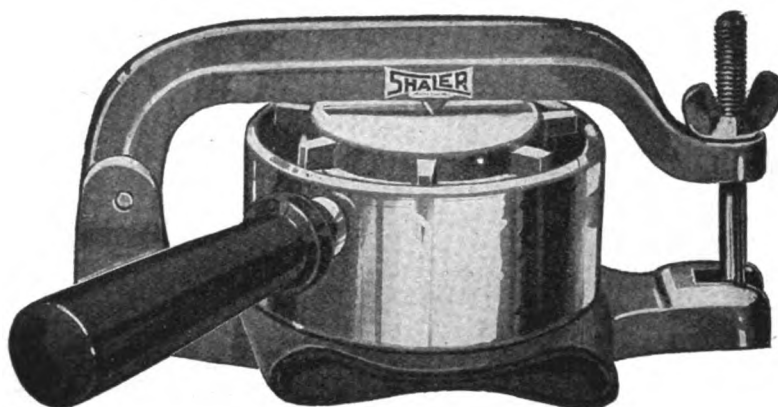
Name

Address.....

Dealer's Name.....

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VULCANIZER REPAIR KIT



**\$2 for this
Complete Vulcanizer**

A vulcanizer that mends tube punctures as perfectly as the most elaborate plant. Eliminates the delay and expense of depending on a garage for every little repair.

It's the only low priced vulcanizer made by experienced vulcanizer manufacturers who understand the requirements of such an appliance. Anybody can use a VUL-KIT. Comes to you with full instructions and a supply of repair material. Nickel-plated—will last a lifetime.

Exclusive Shaler Features

The fuel, gasoline, is not burned in an open cup, but generated into gas and its heat is spread over the vulcanizing surface in such a way as to *maintain* the vulcanizing temperature long enough to cure a repair *clear through*. The superficial cure often mistaken for *vulcanizing* is eliminated.

Universal clamping device insures the even pressure that makes smooth, uniform repairs.

Asbestos pad, inlaid in the plate on which tubes are vulcanized, retains the heat and prevents pinching a tube.

Handle—always cool—allows the vulcanizer to be removed from tire while hot.

A real
SHALER
Vulcanizer
for \$2.

Write today for full details.

Don't fail to inform yourself at once about this wonderful new product of the only exclusive vulcanizer factory in this country. There's a Shaler for every requirement of motorist or garage. Send for catalog and see how we have provided for your needs.

C. A. Shaler Co.

801 Tenth Street,

Waupun Wis.

Boston Automobile Show

The only complete line
of vulcanizers in
the world.

Space F-502

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\$1.50

The "Peerless" Vulcanizer

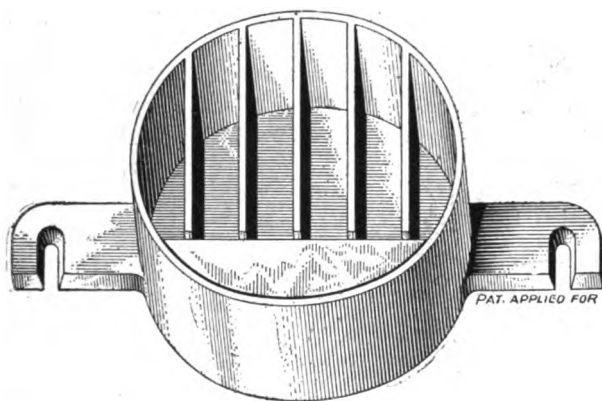
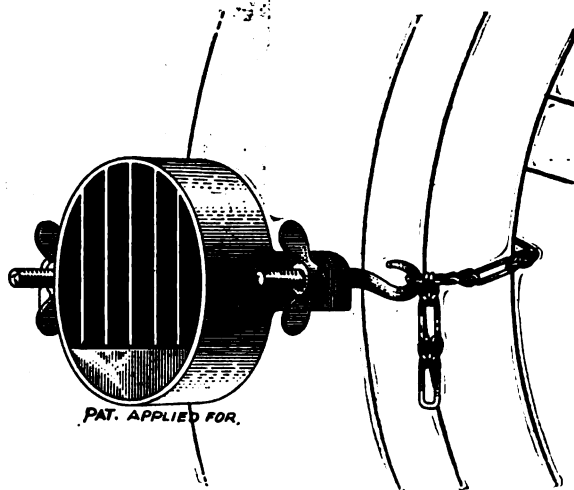
Just think—what your Repairman wou'd charge \$1.00 for, You can do for 5c.

It will do anything that any ordinary Vulcanizer will do.

Perfectly reliable, cannot burn, scorch or over-cure your tire.

We send these vulcanizers to you with a guarantee so broad that competitors cannot possibly meet the requirements—

Your money back if it does not make good in every particular.



Don't neglect your tires. Those little, insignificant cuts admit the sand and water. With every revolution of the wheel the sand works in farther and farther until it reaches the fabric; loosens the rubber from the fabric in all directions. The water rots that fabric and weakens it until it cannot longer support the inner tube. Then "BANG" and you have a blowout.

Such a mishap could never occur if you had a "PEERLESS" Automatic Vulcanizer and used it before the cut or crack got to the "Danger Point." It is the best Automatic Vulcanizer in the world. Covers a space four inches in diameter and does its work absolutely perfect.

You put the rubber patch over the hole or cut on your inner tube. Attach the vulcanizer. Throw in an ounce of gasoline or alcohol and light it with a match, and in less than fifteen minutes the job is finished. Works entirely automatic.

If you cannot get a "PEERLESS" of your local dealer, send us the price and we will send the outfit by return express, ALL charges prepaid. \$1.50, right at your nearest Express office. Also with enough repair material to make from 20 to 40 patches.

Dealers Supplied.

THE LEADER MANUFACTURING CO.

3049 West 25th Street,

Cleveland, Ohio.

Will Not FREEZE

Will not injure any part of the car.

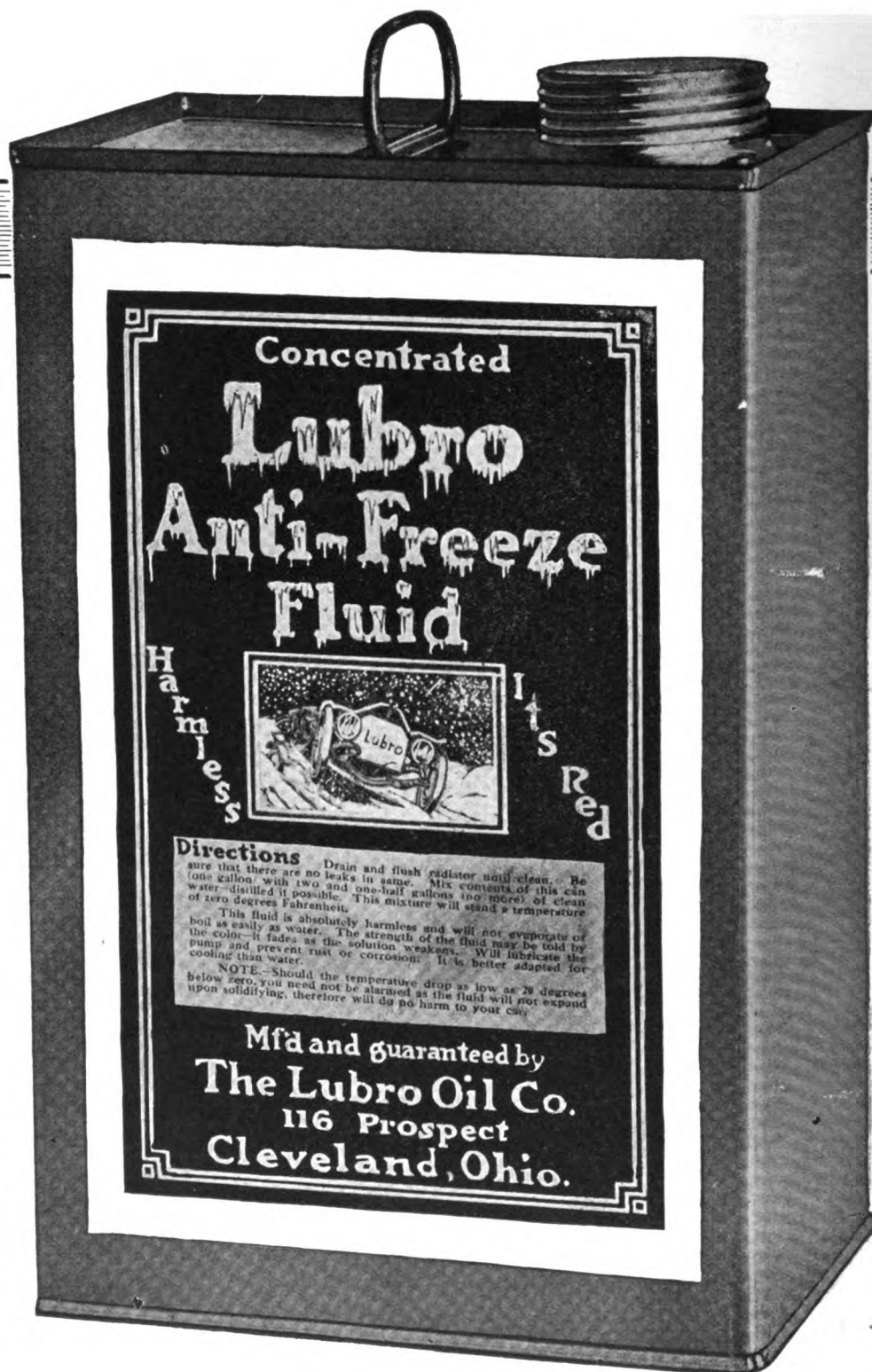
Will not evaporate or boil as easily as water.

Will lubricate the pump.

Will prevent rust and corrosion.

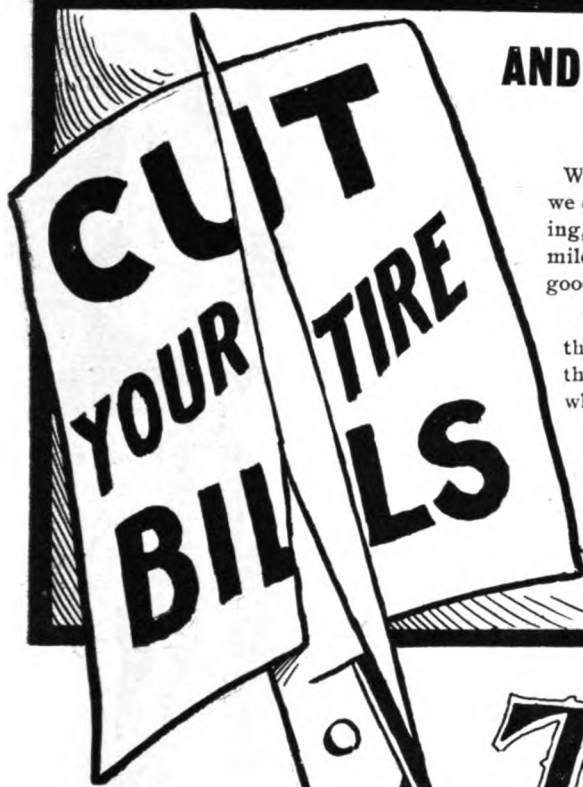
Better adapted for cooling purposes than water itself.

IT'S RED



LUBRO ANTI-FREEZE FLUID is packed six one-gallon cans to a case, in five and ten-gallon jacketed cans and thirty and fifty-gallon steel drums with faucets. We will ship one gallon of LUBRO ANTI-FREEZE FLUID upon Receipt of \$1.50.

One gallon is sufficient for your radiator. One application is sufficient for the season.



DOUBLES
TIRE
MILEAGE

PREVENTS
PUNCTURES
AND
SKIDDING

WRITE OUR NEAREST FACTORY
FOR FULL PARTICULARS AND PRICES

AND MAKE YOUR OLD TIRES AS GOOD AS NEW

With that tread-worn tire of yours as a foundation, we can build you a puncture-proof and non-skid casing, which ought to give you from 1,000 to 2,000 miles more service than your new tires would be good for.

The secret of Triple Tread Success lies in the fact that the Triple Tread affords perfect protection to the fabric carcass and positively keeps out all water, which causes rotting. Rubber treads cannot do this—detachable rubber or leather treads cannot do it—inside linings cannot do it. **Nothing but chrome leather, vulcanized to your tires in the Triple Tread way, can do it.**

Chrome leather, re-inforced by steel studs, is the only thing tough enough, waterproof and pliable enough to make a better and more

economical tire tread than rubber. Chrome leather is ten times tougher than rubber, and waterproof.

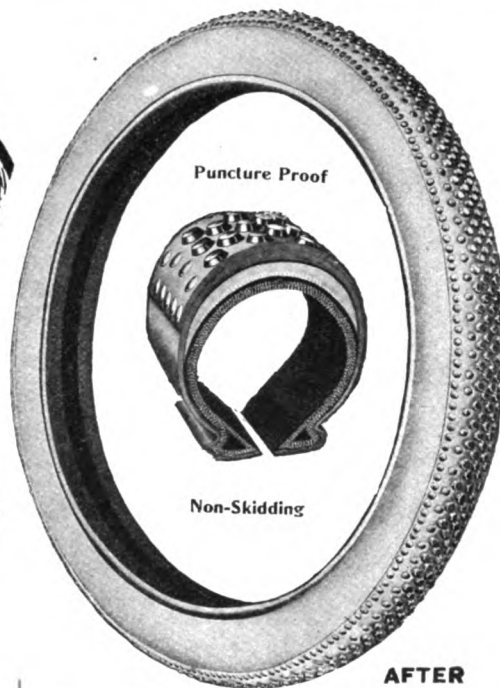


BEFORE

**PUNCTURE PROOF
SKID PROOF
GUARANTEED**

Let us Triple Tread just one of your tires now for a trial. The best time to act is while your car is laid up for the winter. Don't wait till you are ready to take the car out in the Spring.

The TRIPLE TREAD



Puncture Proof

Non-Skidding

AFTER

Triple Tread Manufacturing Co.

CHICAGO
1542 Michigan Avenue

SAN FRANCISCO
542 Van Ness Avenue

WINNIPEG
52 Certie Street

V-Ray

Improved Porcelain

are not sold through the medium
of handing out premiums,
fancy souvenirs, plug
receptacles, etc.

ENDURING Quality

Always has—
and
always will—



\$1.00 Each

Sell the famous V-Ray Plug

Breakproof

Sootproof

Leakproof



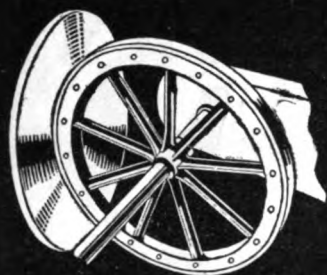
ALL
Jobbers

THE V-RAY CO.
Marshalltown, Ia.

ALL
Dealers



Please mention the Automobile Dealer and Repairer when writing to advertisers.



The Gearless Transmission!

For ten years this simple, reliable car has been growing steadily in popularity. Today it is found giving perfect service in every section of the country. It offers advantages which are impossible in the gear car—and these advantages mean the very utmost in service and satisfaction for you.

A Cartercar Will Save 1/3—1/2 Your Tire Bills!

There are no jerks or jars in starting or stopping—and this means that much of the hardest wear on tires is eliminated. Tires are the big item in the upkeep expense of the ordinary car.

And you know that this smooth, easy running must mean remarkable comfort for the passengers. Then, too, the very deep upholstery and resilient springs make the Cartercar as comfortable as any car can possibly be.

Think of Climbing 50% Hills

The great economy of power secured by the gearless transmission makes it possible for the Cartercar to easily climb the steep-

est hills and to simply play through deep mud and sand. No gear car can offer such service.

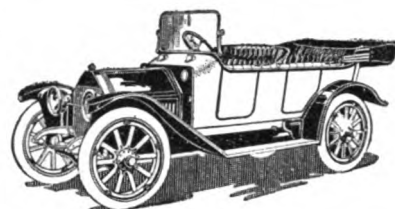
Another advantage is the unlimited speeds. And all with a simple one-lever control. Compare this with the four of the gear car.



Model 5D Five-passenger Sedan. With Electric Starting and Lighting System and Complete Equipment **\$2000**

Of course, all Cartercars are Electrically Started and Lighted. Both of these operations are controlled by a little knob on the front of the driver's seat. This and all other equipment is included in the regular prices.

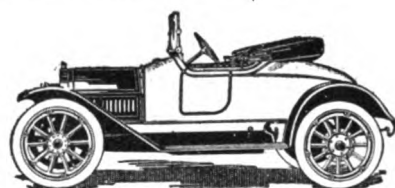
Do you want a car for dependable service—all the time? Then consider the exclusive advantages offered by the Cartercar. Catalogue now ready.



Model 5A Five-passenger Touring Car. With Electric Starting and Lighting System and Complete Equipment **\$1700**



Model 5C Colonial Coupe. Three Passenger. With Electric Starting and Lighting System and Complete Equipment **\$1900**



Model 5B Roadster. With Electric Starting and Lighting System and Complete Equipment **\$1600**

At All The Big Shows



Cartercar Company

Pontiac, Mich.

Branches:

New York
Detroit

Chicago

Kansas City
Atlanta

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Dealers



**Cannot
rim-cut
of course**

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Tie up to the **GENUINE** **DUNLOP** Straight-Side Tire

It is the premier
automobile tire of the world

Our Dunlop Sales have increased 600% within the past year's time and the coming year is destined to show an even greater growth.

Motorists have come to realize what tire experts have long known, that the genuine Dunlop Straight Side is in many respects the ideal type of motor car tire.

The dealer who stocks Dunlop Tires now and pushes them vigorously among his trade will get the full benefit of this tremendous increase in business.

But bear this in mind—the Genuine Dunlop Tire—the tire that has shown this tremendous increase in popular demand—the only tire that possesses all the merits of this type, was originated and is now made exclusively by the

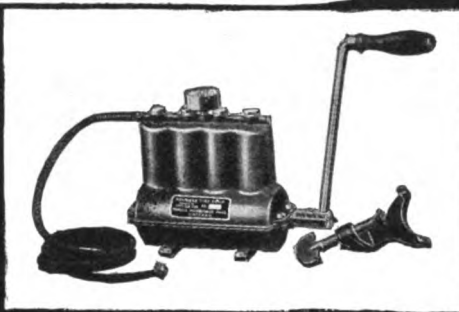
United States Tire Company New York

Please mention the Automobile Dealer and Repairer when writing to advertisers.

**A 9 LB. BABY
WITH HUSKY LUNGS**

Use a PEERLESS PERSPIRELESS PUMP

The Peerless Four Cylinder Hand Tire Pump is built like a gasoline motor by expert designers of compressed air machinery. Inflating tires with a Peerless is tire pumping with all the hard work and perspiration left out. The simplicity of its construction makes it the most easily operated pump ever manufactured. When in use it clamps solidly to the running board of car. When not in use will fit nicely in your tool box.



Peerless Engine Driven Pumps are substantially constructed to be mounted under the hood or foot board of car and driven by gear or chain from some exposed shafting on the motor or transmission.

They are operated by a knob which together with the gauge is mounted on the dash. No lifting hood, stopping engine or shifting of gears is necessary.

Write us today for full information and prices. Sold under a full guarantee. When at the Show visit our factory, three blocks south of Coliseum.

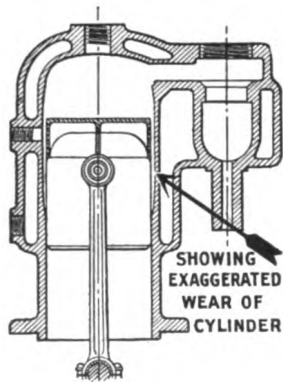
PEERLESS ACCESSORIES MANUFACTURERS

1956 WABASH AVENUE

CHICAGO, ILLINOIS



KEEP OUT OF THE RUT



Just because your motor isn't pulling with all the power it used to have, is no reason why you should tolerate poor compression, lack of power, waste of fuel and oil, noise and probably the smoke nuisance.

When the cylinders of your motor need reboring (and in time they surely will) you have some or all of these symptoms to contend with.

Don't get in the habit of thinking that you cannot help it. Just send us the cylinders and let us rebore them and fit new pistons and rings.

You will think that you have a new motor when you see what our work (and the way we do it) will accomplish. This reboring is a vital repair. It cannot be done under ordinary methods with anything like the accuracy our special machines attain. Why run the risk of having your motor ruined, when

you can send your work to us with absolute confidence that we can and will repair it properly and accurately.

You would be surprised to know the number of high grade motors we have rebored and all with perfect success. Our process is a sure method of restoring power and compression where cylinders have worn or have been cut.

At this time of the year you can spare your car better than at any other, therefore look to the repairs **now**.

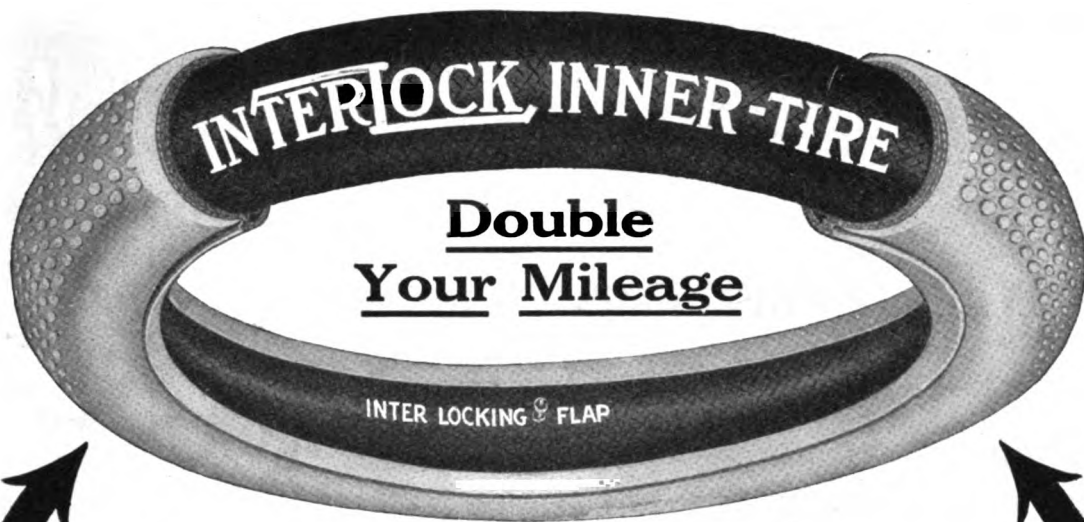
H. B. UNDERWOOD & CO.

(Established 1870)

1019 Hamilton Street,

Philadelphia, Pa.

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The Only Tire Reinforcement That Prevents Rim Cutting or That Will Hold Rim Cut Tires

Tire experts concede that inside fabric breaks and rim cuts ruin 90% of the automobile tires before the rubber tread is half worn out.

Interlocks reinforce the sides of the tires as well as the tread, because they completely enclose the tube, and the interlocking flaps lock to the rim under pressure, giving ample excess fabric strength both to the sides and the tread.

Interlocks prevent blow-outs, rim-cuts and fabric breaks—protect the tube against punctures and free you from the dread and annoyance of tire trouble.

There is nothing experimental about **Interlocks**. They have proved their efficiency by the hardest kind of long, fast road tests under the official inspection of tire experts of the leading tire manufacturers.

The **Interlock** Inner Tire is a high grade, full round **Endless Inner Tire** (not an inner shoe or reliner) and is made like a tire—of rubber and fabric. It is easily placed in any pneumatic tire—between the outer casing and the inner tube—to strengthen the casing and protect the tube against puncture.

Write For Our Booklet

that gives complete description of **Interlocks** and valuable tire information about the care of tires, that will save you a lot of unnecessary tire trouble and expense.

To Dealers: You will find **Interlocks** in all sizes, in stock at Beckley-Ralston Co., Chicago; Motor & Machinists Co., Kansas City; Bi-Motor Equipment Co., Boston; Fry & McGill Co., Denver; Western Auto Specialty Co., Iowa City, Iowa; and all leading jobbers of automobile supplies. Please give us the name of *your* supply jobber when you write. *We want good dealers everywhere.*

Chicago Show Space, 208-9

Boston, Space G.-600

Double Fabric Tire Co.
18 W. 9th Street
AUBURN, IND.



The "**LEAK-PROOF**" PISTON RING may be new to the reader of this advertisement, but there are tens of thousands of them in use that have stood the test of service and time and are giving satisfaction.

Could an article without merit score the success the "**LEAK-PROOF**" RING has?

If the "**LEAK-PROOF**" RING did not prove our claims and "deliver the goods" would we continue to receive repeat orders as we are doing?

One of our customers writes:

"We are very enthusiastic over the "**LEAK-PROOF**" RING. In every case where we have used them, the owners have been more than delighted with the results."

If results are satisfactory with others, why not with you?

For Automobiles, Motorcycles, and Engines of all kinds.

More power with less running expense.

Made any size.

"ASK THE USER."

Can be obtained from all progressive, UP-TO-THE-MINUTE Dealers and Repairmen.

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WM. B. GODFREY, 268 Market Street.

CHICAGO
H. G. PARO,
Suite 39, 106 N. La Salle St.

LOS ANGELES
WM. H. STEELE,
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FORT WORTH, TEX.
E. S. MOBERLEY,
108 Bryan Avenue.

McQuay-Norris Manufacturing Co.
1313 Chestnut Street ST. LOUIS, MO.

Does the trick—**QUICK.**
Finds the leak and fixes it in fifteen minutes.
That's its job.

SE-MENT-O-LE
SELF-ACTING RADIATOR CEMENT

Makers of **CARBONOX**

Makers of **THERMITE**

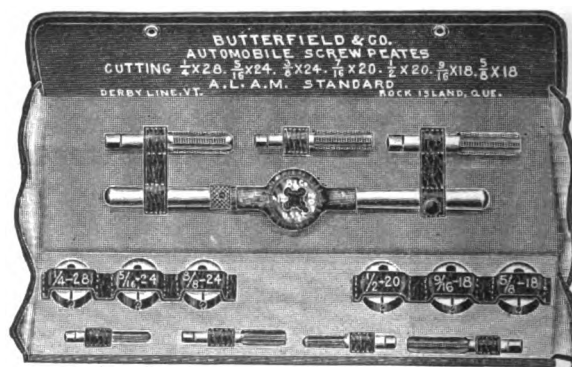
Dissolves in the water.
Congeals when it strikes the air at the leak.
Cement will "set" in less than fifteen minutes.
Drain radiator. Re-fill with fresh water.
75 cents at all dealers.

THE **NORTHWESTERN CHEMICAL CO.**
Marietta, Ohio.

AUTOMOBILE and MOTORCYCLE

Repair Kits are incomplete without one of our **Thread Cutting and Cleaning Assortments.**

In a **GENUINE LEATHER ROLL.**



The most complete and the most widely used sets on the market to-day.

Send for Catalogue and Prices.

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DERBY LINE, VT. ROCK ISLAND, CAN.
New York Store: 126 Chambers Street.

BROKEN PARTS WELDED

We weld cracked cylinders and crank cases—make them as good as new. All repairs made within twenty-four hours after part reaches our shops. Illustration shows cylinder on which we saved the Consolidated Motor Company, of Bridgeport, Conn., \$30.00.

SCORED CYLINDERS A SPECIALTY

By a special process we repair cylinders scored from a loose wrist pin. Bore is not enlarged—your old piston and rings will fit repaired cylinder. Our charge, on cylinders up to 6" bore, \$12.00.

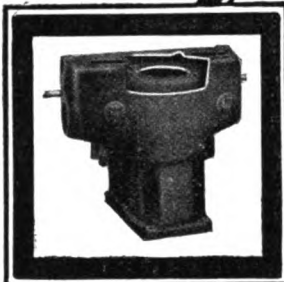
Where cylinder is worn or scored in many places from lack of oil, so that our special process does not apply, we can regrind the cylinder absolutely round and fit new piston and rings. Repaired cylinder will have same compression and motor the same power as when new. Charges according to size of bore. Always send one piston with the cylinders.

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GUARANTEE

If within one year from date of repair, part is found unsatisfactory, ship back at our expense (by freight, collect). Upon examination, we will refund all charges, or, if you prefer, do the work over without extra charge.

Waterbury Welding Company
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Is Your Top Leaking?
Weatherproof it with

"F-S" "Evernew" Auto-Top Dressing

Can't injure the cover—quickly dries—easily applied. Eight standard colors—Special shades to order. Send for color-card and prices.



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"Evernew" Auto-Top Sizing for first coat on mohair, cloth or canvas tops that have never been painted.

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NO MATTER HOW COLD IT GETS

Equip your car with

All-In-One Spark Plugs

and you can laugh at zero weather and disregard the thermometer.



No matter how cold it gets, a few drops of gasoline poured into the priming cup of an ALL-IN-ONE SPARK PLUG will start the most perverse motor that was ever made. And the same priming cup that makes starting easy, insures continually clean contact points.

Simply open the priming cup and let the motor clean the plug every time it explodes.

PRICE \$1.25 Each.

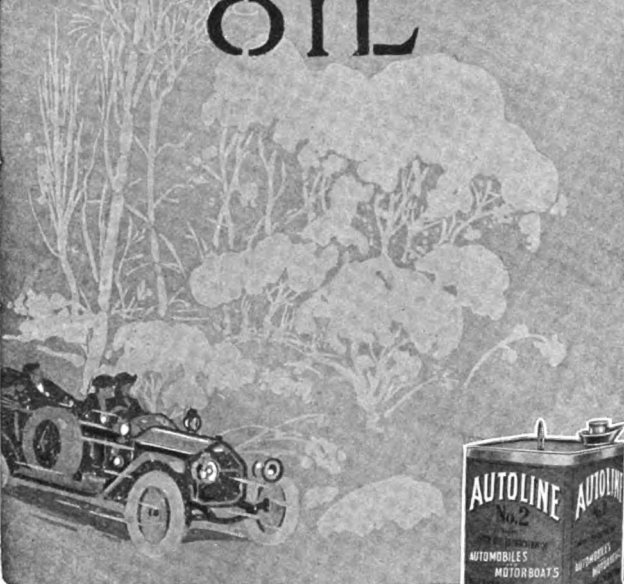
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OIL



THE OIL THAT MAKES GOOD!
At your dealer. If not write direct
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It will give you the accurate capacity of your gas tank. It will detect slow leaks that may be wasting gallons of gasoline daily or weekly.

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When purchasing gasoline, it will measure it accurately for you.

It eliminates your troubles of measuring your gasoline supply with a stick, removing tank cap, and other inconveniences.

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When you own an Imperial Gasoline Gauge you will learn to drive your car so as to get the greatest maximum mileage per gallon, AND WHY?

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WHEN ORDERING simply state Name and Model, also style of finish, Polished Brass, Black or Bright Nickel.

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"GRIFFITH'S IMPROVED."
GUARANTEED
3500 MILES.

Comes with Full Corrugated White Tread.
Have the good points of all other makes incorporated in them.

Sold at about 1/3 off new APRIL STANDARD list.

Clinchers, Dunlops and Q. D. Clinchers.

Prices Guaranteed	Sizes	Independent Tubes Guaranteed
\$9 64	28 x 3	\$2 13
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15 20	30 x 3 1/4	3 09
16 52	32 x 3 1/4	3 25
17 64	34 x 3 1/4	3 46
20 80	30 x 4	4 00
22 38	32 x 4	4 21
23 95	34 x 4	4 46
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Goods Shipped with examination privilege. Money refunded on goods returned intact within a week.

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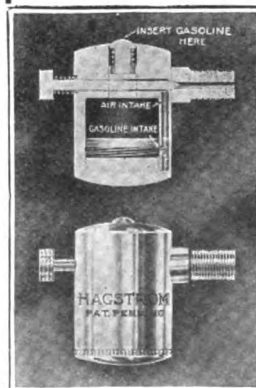
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The Hagstrom Suction Primer

—OR—

Auxiliary Cold Weather Carburetor

Starts your engine in zero weather on first turn-over of motor. Vaporizes the fuel like a carburetor.



Differs from priming spark plugs, pet cocks, etc., in that it does not ruin the cylinder by introducing the fuel in its liquid form.

Easily attached to intake manifold—one for each two cylinders. The intake stroke of the piston simultaneously sucks in the air and fuel, creating a perfect mixture.

Almost indispensable on small cars, motorcycles and motor boats.

\$1.50 Each

INTRODUCTORY OFFER

Get your order in at once for the number you require, remitting by money order, and we'll send them to you *transportation paid*.

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THE HESS-BRIGHT MANUFACTURING
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*Pioneers in the introduction of
Annular Ball Bearings*

Most extensive Resources and Plants
in existence exclusively for Ball Bearing
manufacture.

Enlarging and improving facilities—
product and capacity for distribution.

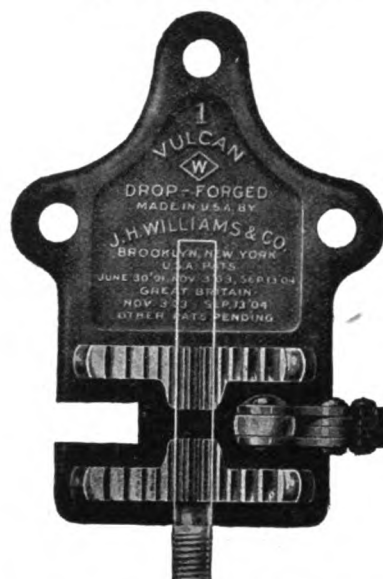
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The No. 1 Non-Crushing "Vulcan"



There is exceptional service for Garage and
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Pipe Vise because it thoroughly adapts itself
to the firm but harmless gripping of irregu-
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the ordinary vise.

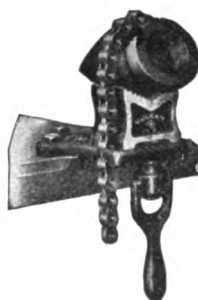
The "Vulcan" Chain adjusts itself to
varied surfaces.

The "Vulcan" Vise adjustment is quickly
made and requires but little effort to
make it—a child can operate a "Vulcan"
effectively.

Small pipe will not bend or be crushed
in a "Vulcan"—see the extended teeth
on jaws.

A "Vulcan" is just a handful in size and
is effective when fastened on either bench
or post.

A "Vulcan" is unbreakable in service
and will last for a life-time with the
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Superior Drop-Forgings

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TRAHERN GARAGE PUMP

**For
GASOLINE**

Utility—Construction—Reliability

A Trinity of essential qualifications guar-
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Owners and to all buyers interested in a

Strictly High Grade Gasoline Pump

Each pump is thoroughly tested and
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All working parts are of simple and practical
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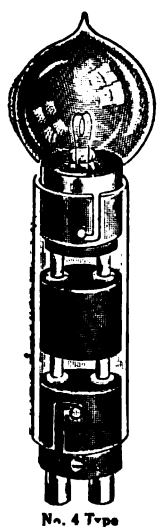
Nothing to Get Out of Order

Every Garage Owner should investigate it.
Write for full information and prices.

Manufactured by
Trahern Pump Co.
Rockford, Ill.

Fig. 386

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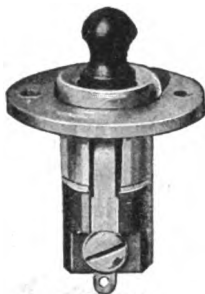
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FOR ELECTRIC AND
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ADAPTERS, ELECTRIFIERS

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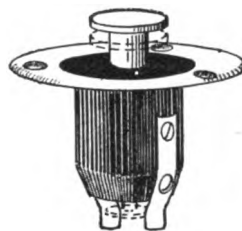
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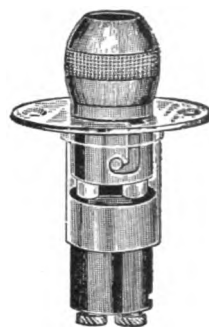
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Connectors



Type SS with Cap

FRANK W. MORSE, BOSTON, MASS.

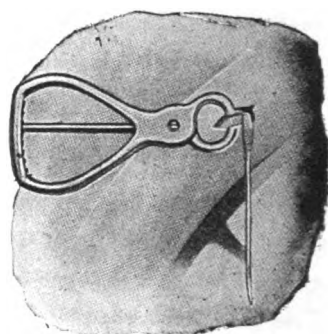
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are as necessary to Car Users as a pocket knife is to you—as useful as a hairpin to a woman. There are 300,000 Car Owners in the United States who KNOW that it pays to repair small cuts in Tires. ARE YOU ONE OF THEM? Hadn't you best write for free copy of "Tire Insurance," or better, send a dollar for a pair of nickel plated PLIERS and combination cleaner and cotter pin hook? They will pay for themselves the first seventy-five miles. They will pay for a set of Tires every 4,000 miles. We guarantee satisfaction.

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Pliers opened, distending cut for cleaning, tool applying gum. Ratchet in handle holds Pliers open. (Pat.)

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Corner of Grand River Ave. and Griswold St., Detroit, Mich.

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Detroit's Most Popular Hotel

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A strictly modern and up-to-date Hotel. Centrally located in the very heart of the city. "Where Life is Worth Living"

Nothing Better at Our Rates

Save TIME and MONEY

Automobile Truck Users.

Send your wheels that need repairing to

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Or to Branch Factory, 12th Ave. and 55th Street,

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NEW YORK CITY.

Full Equipment of the Latest and Best Machinery.

BADGER ACCESSORIES



Badger Side and Rear End Holder will take one or two tires or demountables of any size.

No. 1D. Price, \$3.30
No. 2D. " 4.80
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Write for our No. 4 Tire Holder Catalog and Discounts.

Running Board Holder, Patented Feb. 27, 1912.

Rear End " " Aug. 20, 1912.

AUTO PARTS MFG. CO., Milwaukee, Wis.

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Patents Pending

The ONLY ball bearing combining the following important features: Full complement of balls; continuous, unbroken and full depth raceways.

The bearing also has a non-wearable single piece ball separator. It is equal to the best in radial capacity and superior to all other annular ball bearings in thrust capacity. Ask about our RADIO-THRUST bearing. Made in standard sizes.

Interchangeable with all standard sizes.

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The 400 Steel Blower will serve the youngest mechanic faithfully without expense for a long lifetime.



Crank turns either way

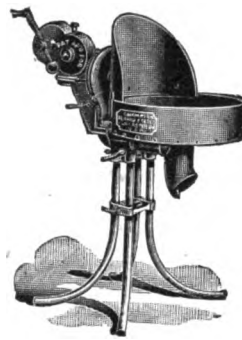
The Famous 400 Champion Steel Blower



WHIRLWIND BLAST

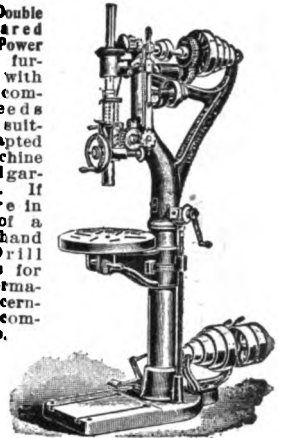
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Over one-half million 400 Champion Steel Blowers and Steel Forges in use. Forever run easy, smooth and noiseless.

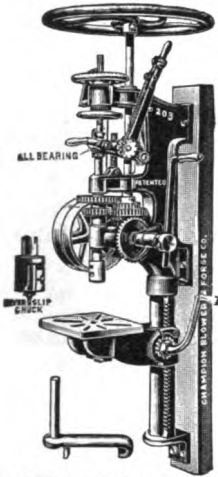


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20-inch Double Back Geared Upright Power Drill is furnished with three complete feeds and is suitably adapted for machine shop and garage use. If you are in need of a power and hand driven Drill write us for full information concerning our complete line.

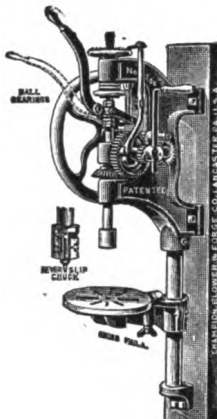


20-inch Drill



No. 203 Self-Feed and Double Compound Lever-Feed Drill

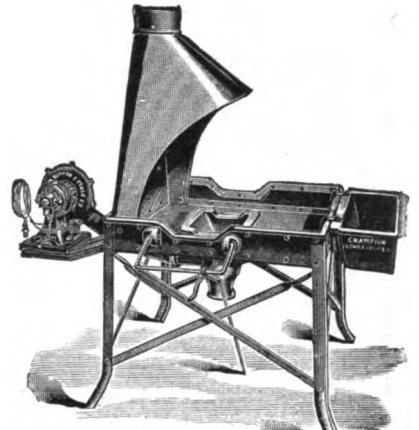
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Before purchasing a Hand Blower, Forge, Drill Press, Tire Bender, Tire Shrinker, Screw Plate, Power Blower or Electric Blower, write for our free catalogue, which always shows the greatest variety of improved blacksmith tools built under one control in the world.

THE CHAMPION BLOWER & FORGE CO.,
LANCASTER, PA.,
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No. 440 Electric Forge

STOP THAT BLOWOUT

If Your Tire Has a Bulge In It, a Blow-out Is Threatening—



THE APPLICATION OF A "UNIVERSAL" BOOT WILL PREVENT IT. With the "UNIVERSAL" you can wear out your old casings, casings that have been badly cut, blown-out or that are in a weakened condition. NO DRIVER OF A CAR CAN AFFORD TO BE WITHOUT A "UNIVERSAL" QUICK REPAIR BOOT. Adaptable to all makes of tires and wheel rims. Made in three types, they meet the needs and purse of every autoist.

THE "UNIVERSAL" REPAIR BOOT

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Every autoist should have one. Every dealer should handle it.

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UNIVERSAL TIRE PROTECTOR CO.

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Do Not Varnish Your Car

VANITY DUSTER, a Liquid Applied With a Cloth, Will Clean, Renew and Polish it In One Operation,
bringing out its original finish, making your car look like new.

SEND FOR FREE SAMPLE BOTTLE.

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makes automobile chains, both riveted and detachable—
all sizes in stock.

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We carry in stock Sprockets for the following cars: Cadillac, Reo, Buick, Brush, Chase Motor Trucks, and all standard commercial cars.

Send for quotations and circulars.

BALDWIN CHAIN & MANUFACTURING CO., - - Worcester, Mass.

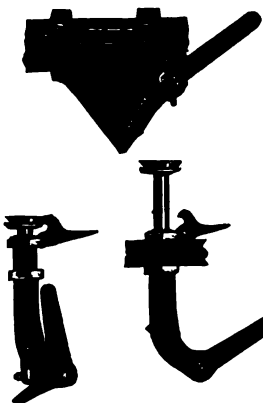
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The Ideal Cut-Out

Simply Cut Notch in Exhaust
Pipe and Clamp over it.

PRICES

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" 6B.	" 1 3/4 " " "	1.65
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Gray Lock Pedal

No. 3.	Black	\$0.60
" 3.	Brass	.75
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*Liberal Discounts.
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ELECTRIC LIGHTING & STARTING SYSTEMS
MAKES GOOD WITH A VENGEANCE.

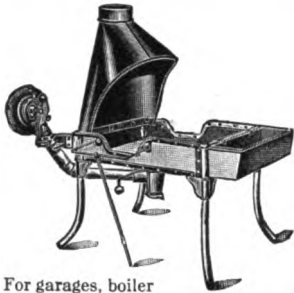
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Make that Repair Job PERMANENT.

Complete Stock For Immediate Shipments. Our wire awaits your wire.
ABSOLUTE SATISFACTION GUARANTEED.

THE PACKARD ELECTRIC COMPANY, 329 Dana Ave., WARREN, OHIO.

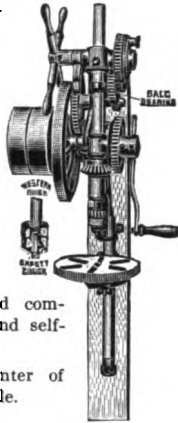
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Royal (Steel) Forge No. 37



For garages, boiler makers, horse shoers or any first-class forge shop.

No. 19 Drill



A low priced combined hand and self-feed drill.

Drills to center of 18 1/4-inch circle.

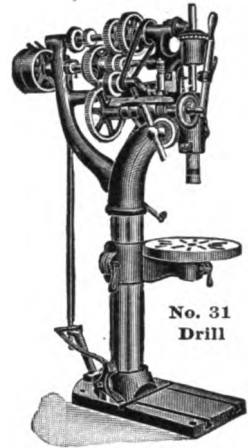
When in need of a
FORGE, BLOWER,
DRILL, PUNCH,
Or SHEARS,

for your garage or repair shop, purchase a Canedy-Otto and get the best.

There is a reason—QUALITY.

Send for Catalogue.

CANEDY-OTTO MFG. CO.,
CHICAGO HEIGHTS, ILL.



No. 31 Drill

20-inch upright drill, gear driven. No belts. Has hand lever-feed, also power self-feed with automatic stop.

No. 1 Shear



For cutting flat and round bars.

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MODEL 1913 G. S. PROTECTOR
GUARANTEED 5000 MILES

Strongest Built Protector in America

Is built to stand the strain of bad wintery roads as well as good—is made to save you money as well as save your "Tire Troubles."

**Highest Quality of Material—
Superior Workmanship.**

An ADJUSTABLE HOOK is used for attaching. A PERFECT fit is GUARANTEED in every instance.

DEPENDABILITY—not price—is the most important consideration in purchasing Tire Protection. YOU can DEPEND on the 20TH CENTURY; it is not only GUARANTEED 5,000 miles, but that it will PREVENT PUNCTURES, BLOWOUTS, RIMCUTS and SKIDDING.

SHIPPED SUBJECT TO EXAMINATION AND APPROVAL.

Don't put it off, but SEND TODAY for Booklet, "Tire Sense," and full detail. We have Special Offer to make in unassigned territory.



**GUARANTEED
PERFECT
SATISFACTION**

Cut out and send this COUPON today, with \$2.00 for this EMERGENCY PATCH. Give it a thorough trial: if not perfectly satisfactory, return it to us, and we will refund your money.

Size of Tires.....

Name

Address

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MAIN OFFICE AND FACTORY: 422 MAIN STREET MIDLOTHIAN, TEXAS
DALLAS OFFICE, PACIFIC AVE. AND OLIVE STREET, DALLAS, TEXAS
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IT'S EASY TO USE—THE BROWN IMPULSE TIRE PUMP

Just give the spark plug, which is furnished with each pump, a quarter turn and lift out the core. Drop in the pump and give it a quarter turn. Start the motor on low speed. No wrench, no broken plugs. Your two hands do the trick in a jiffy.

One to four minutes and your tire is inflated with pure cool air. The gauge tells you when you have *exactly* the right pressure.

Enjoy your car this year. Don't sweat and fume with a hand pump. It's poor economy.

The Brown sells for \$15.00 complete Pump, 12 feet of hose, self-opening valve connection, Highgrade recording Gauge and B'Co Spark plug.

Present Brown pumps made over to fit the new connection for \$2.00, including spark plug.

B'Co Quick Detachable Spark Plugs require no wrench—\$1.50.

Ask your dealer or write to us to-day for full information.

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Seamless Steel Tubing

Over 1,000,000 Feet on Hand.

SEND FOR OUR LIST.

1500 SIZES.

YOUR SIZE IS HERE.

ALSO COLD DRAWN SEAMLESS TOOL STEEL TUBING.

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"PATENT" RELINERS

K & W Dandy and Light Weight Reliners, Inside Patches, Outside Boots, Tire Flaps, Adhesive Blowout Patches, K & W Reliner and Para Patching Cements, Cementless Tube Patches and K & W Cut Filler Kits.

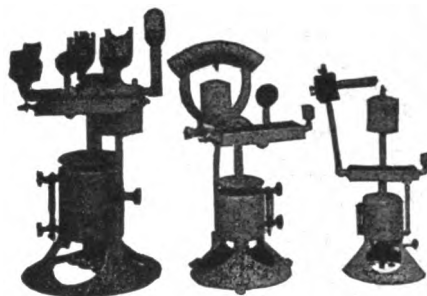
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(Either as a Dealer or a Consumer.)

Write for our K & W Tire Accessory Catalog, and Prices of our Famous "Patent" Reliners—Most Successful Tire Reinforcement ever made.

K & W MFG. CO.
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The vulcanizing system that DOES NOT use air bags. SOLID PADS and HEAVY CLAMPS are the means through which pressure is generated.

Plants from \$25 to \$500

Write for Catalog

HAYWOOD TIRE & EQUIPMENT CO.
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The DAVIS MILLING ATTACHMENT and COMPOUND TABLE

Has Circular Base for clamping to any Drill Press Table, with Dovetail Cross Slides, operated with Screws and Ball Cranks, by hand. Saddle is graduated and swivels to any angle. Table is slotted for clamping down work, Chuck or Vise. Handy for large shops, when the big machines are tied up, for spotting castings, milling off ends of bosses, etc.; for small shops that cannot afford expensive machines; diemakers, locksmiths, pattern makers, repairmen and automobile garages. It will cut key seats and mill cams. For use with end mill, fishtail cutter or formed cutters.

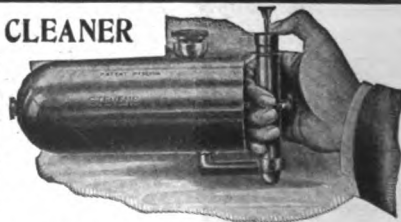
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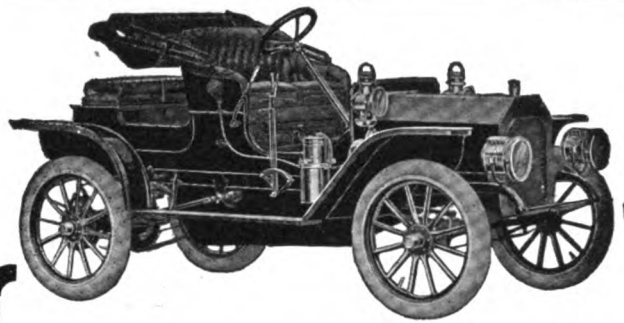
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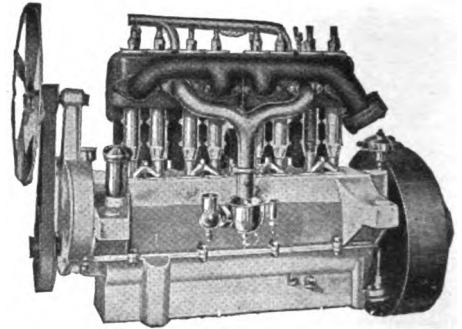
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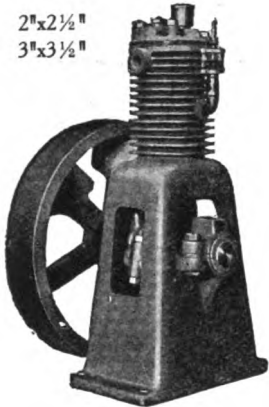
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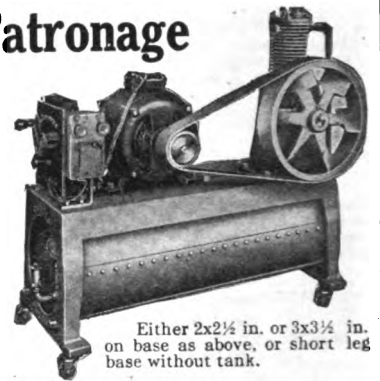
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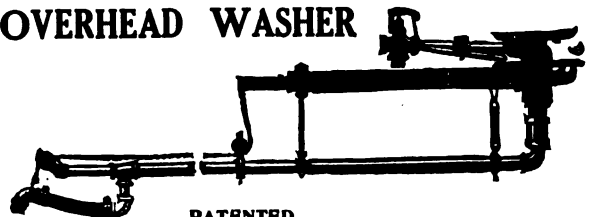
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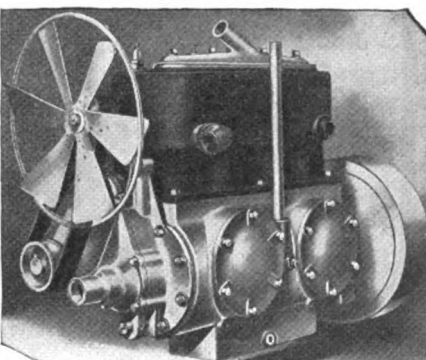
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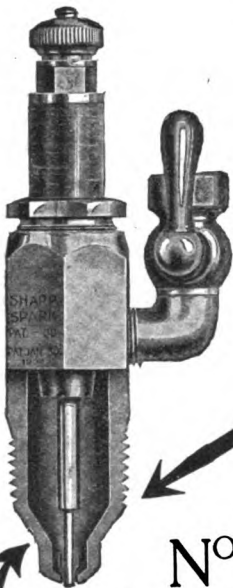
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VOL. XIV, No. 6.

NEW YORK, FEBRUARY, 1913.

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ELECTRIC VEHICLES CONTINUED.

Testing for Shorts, Various Sources of Trouble, to Find Disconnections, Etc.

No. 7.

BY SIDNEY F. WALKER, M.E.

As heretofore stated, "shorts" in the armature show themselves by the liberation of heat. The coil which is "shorted" heats up. But it is very convenient to have a method of finding "shorts" before the machine has been run. There are many cases where the indication of a "short" would be serviceable, before the armature has been put into the machine. The commutator has to be turned up occasionally. With modern machines, commutators wear down very smoothly, very slowly, and turning up is, or should be, very seldom required. It may happen that owing to some fault in the construction of the commutator, to having a faulty segment, faulty insulation, faulty metal, faulty building up, or some other cause that ought not to be present, the commutator wears rather quickly, and has to be turned up. The usual method of turning up is to put the armature in the lathe.

However carefully this may be done, the tool invariably carries over minute pieces of copper from one segment to the next, in the direction of rotation. Those who have turned up commutators frequently, know of this, and clean out the spaces between the commutator segments, before attempting to run the machine.

However carefully this may be done, one or more "shorts" may be left. A very minute speck of copper between two adjacent segments, a speck that is almost invisible, even to the trained eye and absolutely invisible to the untrained eye, will cause a "short," leading to a burn up of the "shorted" coil if the machine is run even for a few minutes. The "short" may be found by the aid of a telephone, and a dry cell.

A circuit is made as shown in Fig. 24 consisting of a dry cell, telephone, and two test wires. The two test wires may for convenience be connected to an insulated fork. The fork should be so arranged as to insulate the two test wires from each other and the two testing conductors, and be provided with an insulating handle. Again the difference in sound will show when the "shorted" coil comes under the test wires. In testing, the two test wires or the two conductors in the fork connected to them, are placed on adjacent segments of the commutator, passing all around the commutator in rotation. As connection is made between any two segments, a click is heard in the telephone. The click when a "shorted" coil is in the circuit is louder, and can be detected at once. A better method is shown in Fig. 25. A circuit is made of a dry cell, a telephone and electromagnetic circuit breaker and test wires. The test is made as before but the sound in the telephone is very much more pronounced.

Testing for Disconnections in Brush Gear.

With brush gear, there may be disconnections and "shorts," and either of them may cause the stoppage of a machine. When a machine has been pulled to pieces to be cleaned and done up generally, and when everything is apparently in order, or the engineer believes it is, he puts the brushes down, switches on the current, but the motor does not move. The reason is, there is a break in the path leading to the field magnet coils.

A break in the circuit formed by the two or more commutator segments, the brushes, brush spindles and other connections, and the wires leading to the field magnet coils, prevents the passage of a current through the field magnet coils; no magnetic field is

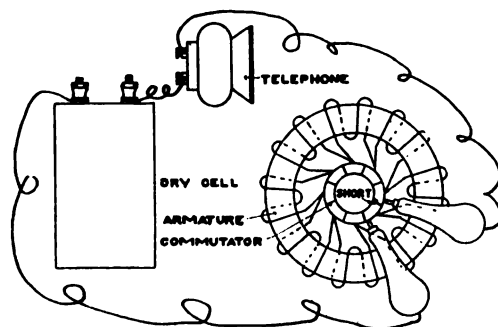


Fig. 24—Circuit for testing for a "short" with a telephone.

created, so that there is nothing to cause motion of the armature, and with the series wound motor, a break such as described prevents any current passing through the armature coils. The danger is, when a machine is being overhauled, while the parts of the machine are lying about, and are being more or less handled, they may become covered with a film of oil, that will be unnoticed. The film of oil will very often prevent the passage of the current. Careful examination is the best remedy, as for all troubles, followed by very careful cleaning of the brush spindles, of the eyes of the brush shoes which run upon the spindles, and careful tightening up of screws, etc., which hold the brush shoes upon the spindles.

A test similar to that described in the previous article for disconnection, may reveal a fault of the kind, as shown in Fig. 26. It may be taken that either a low reading ampere meter, or lineman's detector galvanometer, with a dry cell, and a couple of test wires, as shown in the figure, will be found very useful for testing wherever a disconnection is suspected. In the present case, securing or firmly touching one test wire on to, say, the brush spindle, and working backwards with the other test wire, touching it first on the brush spindle itself to see that the apparatus is working properly, then upon the brush shoe, then upon the brush, and so on, will show a fault, because the deflection will cease immediately the fault is passed. If for instance the brush is not properly held

in its shoe, touching the second test wire upon the brush shoe, a deflection will be shown, while touching it upon the brush itself, no deflection, or a reduced deflection, or, what very often happens, an intermittent deflection, will be shown. When either of these occur, the part of the apparatus that has just been passed over, should be carefully examined. The brush may be loose in the shoe, or where there is a copper wire connection to it, that may have been broken, or may be broken and making contact occasionally, and so on.

There may also be a disconnection where the wire leading to the field magnet coils is connected to the brush spindles. The arrangements for these connections vary very considerably, but there must be a terminal of some kind, and it may easily happen that the wire is broken under the terminal, while its insulating envelope holds it in place, and conceals the break. There may also be a disconnection in the field magnet coils themselves.

"Shorts" in Brush Gear.

By "shorts" or short circuits is meant in the case of brush gear, a connection between the positive and

negatively affected. If both are quite grounded, if both brush spindles are connected to the frame of the machine, a dead short exists, and no current will pass through the armature.

Again, it is not easy to know when to look for a fault of this kind. It is better to provide against it by constantly testing the insulation of the brush spindles. This is easily accomplished by a proper testing set, as shown in Fig. 27. An insulating testing set should be a part of the equipment of every garage dealing with electrical vehicles, and when any motor is brought in for repair, the insulation of every conductor on it from the carcass of the machine, should be carefully tested. The insulation of the brush spindles from the collars or rings to which they are secured, is necessarily by flanged collars of insulating material. With low pressure machines, such as are employed in electric vehicles, vulcanite, and vulcanized fibre are generally used; though moulded micanite, which is employed for high pressure generators and motors, is gradually taking their place. With vulcanized fibre, the danger is that it may get saturated with oil, and its insulating properties are then

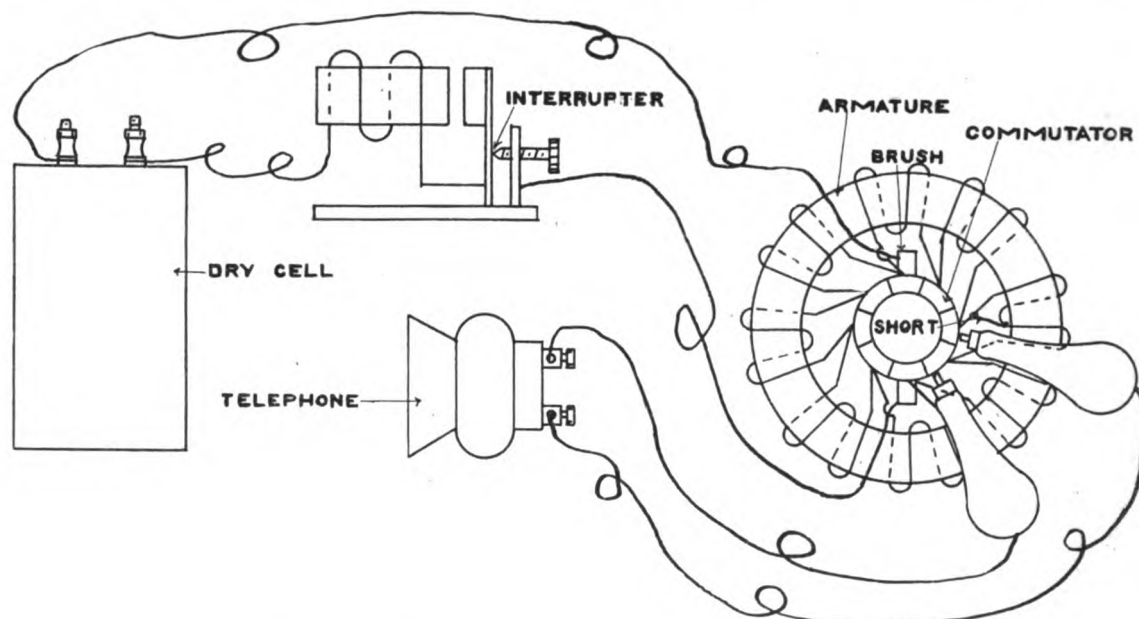


Fig. 25—Diagram of arrangement for testing for a "short" with an interrupted current and a telephone.

negative brush holders. In modern motors, the brush spindles are held upon rocking arms, which are made to move through a certain arc of a circle, either round the bearings, or round a collar provided for them on the face of the cylinder enclosing the field magnets. The brush spindles necessarily are insulated from the collars or rings which hold them. If they were not insulated, any current which entered from the positive brush would cross immediately to the negative brush, avoiding the armature, so that no current would pass through the armature coils. If the insulation of one of the brush spindles fails, the brush spindle itself becomes connected to the body of the machine, or ground. The connection of one brush spindle, and one set of brushes to "ground," will not stop the working of the machine, unless there is a ground on elsewhere, as say at the accumulator or controller. If one brush spindle, however, is "grounded," and the second also becomes "grounded," or even partially "grounded"; or if both of them are partially "grounded," the working of the machine will be se-

gradually lowered. With good micanite, there should be very little chance of anything of the kind happening; but there is micanite and micanite. Bad micanite made from small pieces of inferior mica, and with a binding material not free from substances in which electrolysis may be set up, and the whole thing possibly not properly moulded, may also begin to lose its insulation. There is a further danger; when the car is running a certain amount of heat is developed in the motor, and it may happen that the expansion of some part of the apparatus squeezes the micanite, or the vulcanized fibre or vulcanite at a weak point, and lowers the insulation there.

Another Source of Trouble.

The insulation of the brush spindles from the collar or ring to which they are attached, is also frequently broken down by the deposit of dust upon it. In many cases, oil is spilt on the flange of the insulating sleeve, and carbon and other dust settles upon the oil, with the result that the insulation is lowered to a certain extent. There is a far more serious result

however that usually follows, viz.: After a certain amount of dust has been deposited, the distance between the two sides of the insulating sleeve is almost bridged so far as sparking is concerned. It should be remembered that there are always two ways in which any insulation may break down. It may simply deteriorate from various causes, the insulating resistance becoming less and less, and it may break down suddenly owing to the passage of a spark through it. A good insulator in the sense that it prevents leakage, is not always a good spark resister. Again, the resistance to sparking is often considerably reduced by accident, while the insulation resistance may remain at a figure that allows the apparatus to go on working quite satisfactorily. When everything is right—when the flange of the insulating sleeve of the brush holder is dry and clean—there is no tendency to spark across, particularly with the low pressures used in electrical vehicles. When, however,

tions of wires, or from the breakdown of the insulation of some of the wires, of the drum itself, or of the fingers. The connecting wires have to be crowded into rather a confined space, and in too many cases the question of the mechanical strength of the insulation is not considered. The electrical pressure to which the insulation is subject is small, and therefore a comparatively low insulation resistance would answer; but there is the question of the mechanical strength; the ability of the insulating envelope to resist abrasion, wear, squeezing, and similar causes of trouble. One of the things the writer would advise any intending purchaser of an electrical vehicle to carefully inspect would be, the size and insulation of the wires connecting the accumulator with the controller and with the motor, and connecting the controller with the motor. The wires themselves should be as strong as possible, and not because their resistance would be low; in the short length of wire

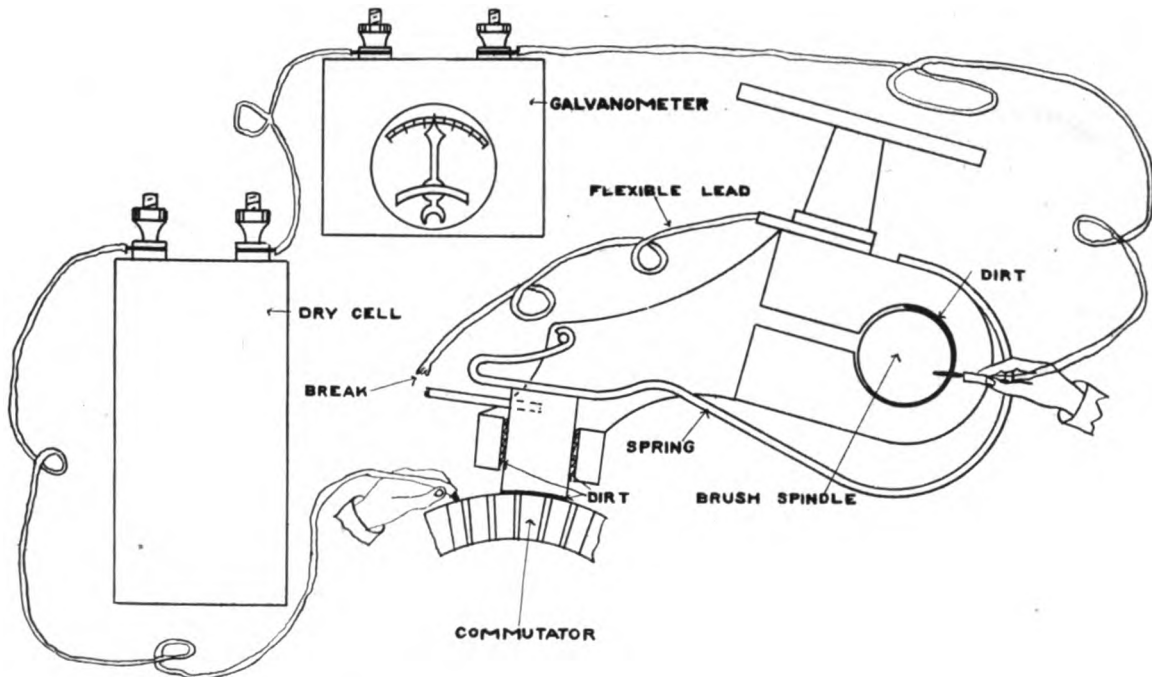


Fig. 26—Showing how a brush shoe may be disconnected from its spindle by a layer of dirt and how to test for it.

moisture or oil is present on the surface of the flange, and dust has been deposited upon it, and when some change takes place suddenly in the circuit, when the current passing into the motor is suddenly and largely reduced, a spark may pass across the last small gap. The heat caused by the spark may burn up a certain portion of the dust, and the combustion of the dust may wreck the insulation of the sleeve. A variation of this is that under certain conditions a small current may pass by way of the dust. The current so passing burns up the dust, the combustion of which wrecks the insulation of the sleeve. There is no need to give any instructions as to how to find a fault, when this has taken place. A most cursory examination shows it. The remedy, however, can be easily applied; it consists in keeping the insulating sleeves perfectly clean and bright.

Troubles in Controller and Connecting Wires.

The principal troubles met with in the controller have been mentioned above. They are due to either dirt interposed between the contacts due to the spark, to the springs holding the contact fingers not being sufficiently strong, losing some of their tension, and the fingers in consequence not making proper contact. But troubles may also arise from disconnec-

required for connecting the accumulator with the motor and controller, the resistance of even very small gauge wires would be small; but small wires tend to break off very easily at their terminal screws, and they are very easily eaten in two, if any acid or even water is spilt upon them, where they are exposed. The passage of the current through the wires renders the copper brittle, and it is particularly liable to break off where it is squeezed under a connecting screw. The wires should be as large as space will allow. If they can be employed, a solid wire is better than a stranded wire, because of the chance of the stranded wire being easily eaten in two. The stranded wire is more flexible, but if any portion of it is exposed, and water or acid is spilt over the exposed part, it has so many more surfaces to act chemically upon, that parting very quickly takes place.

The question of the material used for insulation is a somewhat troublesome one. Good rubber, in the writer's view, is by far the best material; but it is readily softened by oil that may be spilt over it, and it is also easily damaged by both water and acid. If the rubber covered wire is drawn into a very flexible lead tube, it is protected very largely from mechanical injury, and from oil and acid. Paper cov-

ered wire drawn into lead tube also answers fairly well, providing that the paper is very good, that the ends where the connecting wires issuing are very carefully sealed down, and that the tube itself is very flexible, and has been very carefully prepared. The great danger with paper covered wire is the possibility of moisture getting inside the lead covering, and attacking the copper wire at some point where there is a flaw in the paper. Good paper covered wire is insulated with very strong fibrous manilla paper, cut into strips, the strips being laid on spirally, in such

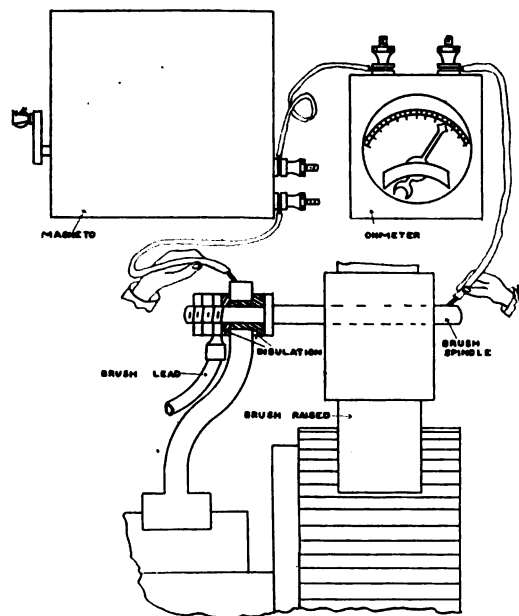


Fig. 27—Diagram showing arrangement for testing the insulation of brush spindles. The apparatus employed consists of a magneto to furnish current and an ohmmeter reading the resistance directly and test wires.

a manner that the different strips overlap each other's joints; and the paper is afterwards impregnated with a resinous oil, and the wire is then drawn into a lead tube; or a lead tube is formed upon the paper. If the manilla paper is not as strong as it should be; if a cheaper and inferior quality has been employed; or if again pure resinous oil, oil free from acids has not been employed, there will be weak places in the insulating material. There may be holes in the paper, through which moisture will penetrate, and will find its way to the copper wire, eating it in two inside the paper. It will be remembered that the presence of moisture between a copper and a lead conductor sets up a galvanic battery, with the result that one or both of the conductors is eaten away. In the case of a cable, the electro chemical action is aided by the electrical pressure that is present for a large portion of the time, and by the leakage current.

The danger from defective insulation arises from the possibility of wires that should be insulated from each other, becoming connected together. Where the wires are squeezed up together as they necessarily must be, in the neighborhood of the controller, if the mechanical strength of the covering of the wire is not sufficiently strong to withstand the squeezing, the vibration, and sometimes the wear caused by one wire moving over another, the insulation between the two adjacent wires may break down, and the working of the controller is upset. With paper covered lead enclosed cables, the same thing happens if the paper insulation breaks down, and as may very easily happen, the copper conductor becomes connected with

the lead covering. When this happens in two insulated wires lying side by side, virtually they become one wire.

The importance of this will be understood when the office of the controller is considered. At starting, for instance, the accumulators or the field magnets are connected in parallel, it will be remembered, and a resistance is inserted in the circuit. Two adjacent wires coming into contact through the failure of their insulation, may cut out the resistance, and so the full pressure of the cells in parallel may be delivered immediately to the motor, or the full pressure of the accumulators to the field magnets in parallel, and so the powerful current that ought not to pass, as explained above, when a motor is to start, does pass, and either the motor is not able to start, or if it does, considerable heating takes place, and its insulation is damaged, with further trouble later on.

These remarks apply to all the wires that are employed for connecting the battery to the controller, and to the motor, and for connecting the controller to the motor. Owing to the conditions under which the whole apparatus has to be fixed, the wires may have to be bunched together, and the above results may follow.

If the ampere meter and volt meter which should be fixed on the dash board are carefully watched, as explained, warning will nearly always be given of trouble of this kind. A heavy current will be shown when only a comparatively small current should be passing, when the controller is thrown to the first starting notch. By careful observation also of the currents that pass under normal conditions, with the controller at different points, warning is given of any breakdown of insulation; and usually by an increase of current.

It may be taken as an axiom, that sudden increases of current, not due to any proper cause, such as an

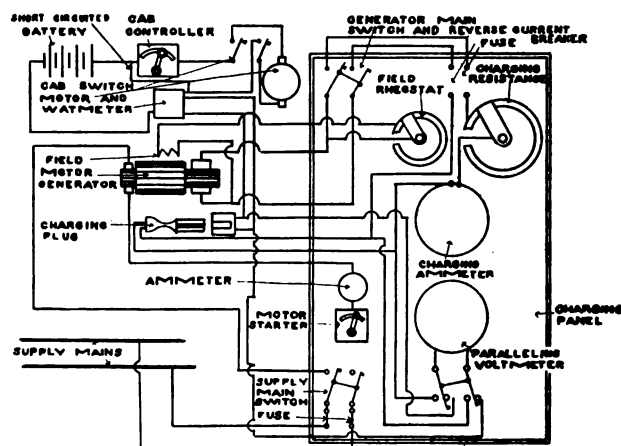


Fig. 28—Diagram of connections for charging an accumulator from electrical supply mains by the aid of a motor generator, to convert the pressure where necessary and to reduce the pressure where necessary.

additional load due to hill climbing, or to a rougher road than has previously been passed over, means that some part of the insulation is breaking down.

To find disconnections, the same process may be adopted as that described for disconnections in the motor brush holders. Whenever a disconnection is suspected, it may always be discovered by the aid of the ammeter, or lineman's detector, and a cell. For detecting a failure of insulation, tests with the full pressure of the battery are necessary; and it is wiser to test with a larger pressure. Portable instruments

are sold specially for the purpose of testing, by which the insulation resistance of any apparatus, any wire, is read off on a dial. The apparatus consists of a magneto electric machine, very similar to some of those employed in modern gasoline motors for ignition, but it is arranged to be driven by a handle, and only furnishes a very small current.

To the instrument is attached what is practically a galvanometer; an instrument having a number of coils of wire, through which the testing current passes, a needle magnet being suspended inside of the coils of wire, and moving a pointer over a dial shown above. To use the instrument, a circuit is made by connecting the two terminals of the instrument, one to the insulated wire, or insulated conductor of any kind whose insulation resistance is to be tested, and the other to any part of the body of the carriage. The quantity of current passing through the coils of the galvanometer forms part of the testing apparatus, is really a leakage current, and indicates the amount of the insulation resistance. The higher the insulation resistance, the smaller the leakage current; and the smaller the deflection of the needle.

ENGAGING A CHAUFFEUR.

The Varied Experiences and How It Finally Ended in Self-Driving.

As is well known, that concomitant of automobile development, the chauffeur, has been the subject of a good deal of criticism, deserved and undeserved. On the one hand, he has been pictured as incompetent and crooked—an employee to be watched and regarded with suspicion; on the other, as one in whom the qualities of an engineer, a mechanic, a Chesterfield and a servant must be combined in such proportions as his employer required, *mutatis mutandis*.

Chauffeurs are like other mortals; they are good, bad and indifferent, the proportion of the bad and indifferent being rather large, no doubt, owing to the sudden call for them at the outset and the natural proclivity of the average mortal to rush to highly paid employment when he is not already doing fairly well, which is usually the case with the inefficient.

But whatever the attraction for this work may have been a few years ago, like most other well paid work, it soon became overcrowded. The extent of this overcrowding is illustrated by the number of chauffeurs advertising for places in some of the daily papers in the large cities. In the current issue of the New York Herald there are 22 of these advertisements and not a single advertisement for the services of a chauffeur. We recall one instance where a young man whom we know personally passed his examination successfully but has since been unable to secure a position although of exemplary character and having the highest references. He is now working in a shoe shop.

But speaking of chauffeurs, an Englishman, not long ago, purchased a second-hand car and decided to indulge in the luxury of a chauffeur. He tells the story of his experience thus:

After carefully discussing the matter with my wife, who, woman-like, persisted in doing all the discussing, we finally came to the conclusion that a man willing to assist in the house and garden, and fill up his spare time with the car was what we required.

A careful perusal of the advertisements in a prominent weekly motor journal failed to disclose a suitable disengaged chauffeur. There were the usual

batch of "life abstainers" and "thoroughly competent certificate holders," together with "gentlemanly chauffeurs" willing to give their valuable services in return for comfortable situations. Another advertiser sought an opening as a companion-driver to a lady, while yet another praised the virtues of his only child, which was "bright and willing." My wife insisted upon having a voice in the selection of the man to whom we were both in the future to entrust our destiny.

"You see," she remarked, "a chauffeur's face must fit the car, and you could never manage to match me even a bit of silk at the store."

"I am well aware of that," I replied with dignity, "but the engaging of a chauffeur is a diplomatic duty only to be entered upon by a man capable of obtaining value for money."

"Ah! well," sighed my wife, "a man may obtain value for money, but it takes a woman to secure a bargain."

"We want no bargains," I interposed; "neither do we want a shop-soiled remnant from a previous unsuccessful career, one that has been renovated in a correspondence school and put upon the motor counter ticketed with a beautiful certificate, the whole lot dirt cheap, but yet dear at any price."

"Oh! do have a man with a license; think how pretty it would look hanging in a prominent position in the garage!"

"Probably so; but think how pretty we should look being driven about by a man only suitable to drive a wooden galloping horse on a merry-go-round."

"Don't these motor schools teach pupils anything, then?" queried my wife.

"Yes, they do," I answered; they teach them how to explain in a most convincing manner exactly why the car isn't running most of the time."

"But I always understood that a chauffeur with a license was bound to be competent."

"That is so; competent to unscrew in two days everything unscrewable that afterwards will take an expert two weeks to screw together again."

We finally decided that the only way to obtain a desirable chauffeur was by advertising, so after hours of labor and reams of paper had been expended on its production, the following was duly drafted:

"Wanted.—Chauffeur-gardener-handyman; steady and capable. Small car, corresponding wages. Apply, 3 o'clock, at 24 Wantinquick Street."

This was sent up for insertion in a daily paper selected by my wife because the proprietors gave away half-a-pound of tea to all small advertisers—another example of "something for nothing," perhaps.

Having made arrangements to leave business early on the day the advertisement appeared, I slowly wended my way homewards, inwardly debating the numerous questions I intended asking all applicants.

What a sight met my eyes as I turned into "our" street!

An immense crowd of would-be chauffeurs were gathered in front of my house, each with the chauffeur's trade-mark, a "Woodbine," protruding from his lips. They were of various ages, from 16 to 60, all sizes and conditions, some motory and others horsey. All were gazing intently at my door, prepared to make a final dash for the steps when the neighboring clock chimed the hour of three.

Murmurs of disapproval met my attempt to elbow a passage through the crowd, and one uncouth individual remarked, amid roars of laughter, "It's no

go, old sport, your shuvving days are over; shuv off home and shuv the kid's perambulator."

Having at last managed to enter my residence, I held a council of war with my wife, who advised me to see the thing through and interview the lot.

Arranging ourselves in a becoming and imposing manner, we instructed our maid to show the applicants in one at a time.

The first to enter was a long and lean individual with a sallow complexion, a most pronounced squint, and his hair parted down the center with mathematical precision. He appeared somewhat of a cross between a marine and a letter carrier, but was certainly much too big for our small car. He assured us that he was a life abstainer, but left an element of doubt as to whether it was from beer or work. His experience was great, having had 13 situations in 12 months. He was capable of driving any make of car, but in reply to my question, regretted never having driven a limousine car, but knew the makers, Messrs. Limousine & Co.

The next applicant was a florid, round-faced country chap, with a pair of side whiskers. I knew he was from the country by the look of honesty upon his face that quite took my fancy. He candidly explained that he knew nothing of cars, but was willing to learn. He was, however, a good gardener, his father being a small farmer with three acres and a cow.

I promised to communicate with him by post.

Applicant No. 3 was evidently a more suitable candidate. He answered my questions quite satisfactorily, and appeared to be well up in his work.

"Are you quite steady?" I asked.

"Steady, sir?" he replied: "my last boss told me if I was any steadier I'd be motionless."

The next man gave us quite an interesting list of the excessive speeds he had accomplished at the races. I endeavored to give him a word of caution by remarking:—

"The faster the chauffeur drives the sooner the ambulance may overtake him."

"No fear of anything overtaking me," he replied; "I used to be a horse car driver."

Before ushering in the next applicant, the maid handed me a telegram. I hastily opened same, only to find the following:—

"Do not engage a duffer, see me. Tomkins."

Although thinking how interesting it would be to see this personality Tomkins, I proceeded to interview the remainder of my applicants. No. 5 was satisfactory in every way, but when it came to the question of wages, I discovered that he required about double what I consider any chauffeur should be permitted to earn. Too much money is likely to swell a working man's head.

"I cannot afford to pay big wages," I remarked. "I have been studying the 'cheaper motoring' articles in the newspapers."

"If it's cheaper motoring you want, guv'nor, take my tip and stick to a trolley. You get a lot for a nickel, especially on a foggy day."

Another one offered to run my car on a contract scheme. He endeavored to explain this very plainly to me, and tried hard to convince me that I should save money by that system. All I could gather from the idea was that I was to provide the car, garage it, engage a man to wash and clean same, pay the contractor's wages, find him clothes, etc., and insure the car. Then on paying the contractor about twice as

much as it costs me per mile to run the car, I was to be permitted to sit in the same and ride when and where the driver wished. By paying him an extra amount, I was, all circumstances permitting, to be allowed to drive my own car. This was only when the contractor had no use for my car, either for himself or friends. If he was at any time incapable of driving the car from drink or any other cause, I was to resort to the taxis or subway.

The last applicant interviewed was "Fred." As soon as he entered the room I knew Providence had sent us a man made for the job. He looked a chauffeur, every inch of him, of which there must have been at least 50. He simply reeked of gasoline, though my wife was unkind enough to suggest alcohol. I, however, accepted his assurance that the only time he touched alcohol was when experimenting with it as a fuel. That man's knowledge of cars was wonderful, and he explained that he was never satisfied with an engine until he had got out of it 20 more revolutions per minute than was possible. Ten minutes' chat with Fred was more instructive than any motor handbook published.

He simply had a mania for pulling things to pieces and putting them together again, and used to carry a toothpick to extract the dust from out of the crevices.

To test his smartness I asked him a few questions.

"Can you tell me how far the moon is from the earth?" I asked.

"Well, I cannot say as I can," was his reply; "but I reckon it ain't near enough for me to run into."

"Why did you leave your last situation?"

"Too much work, sir; work first thing in the morning, work all day, and work late at night," answered Fred.

"How long were you there?"

"One day, sir," meekly murmured Fred.

"Will your late employer give you a testimonial?"

"He said he would give me two if I would leave without notice," was the answer.

Anyway, Fred being able to satisfy my wife as to his strict sobriety and respectability, we decided to engage him. After he withdrew, I instructed the maid to inform the waiting men that the vacancy was filled, an announcement they appeared to resent.

Continual knocks at the door accompanied by strange noises that appeared to represent cat-calls, finally induced me to go to the window and assure them they were only wasting their valuable time by waiting further.

One of the crowd called for "three cheers for the old man," which were heartily given over and over again. As a final method of wreaking their vengeance upon me, they commenced to sing lustily "The Marseilles." This was only terminated by the police, who, as usual, came sauntering up at the finish.

However, Fred left me after he received his first week's pay which he demanded a little before it was due. Since then I have driven my car myself.

Low Tension Magneto Trouble.

The following fault with a low tension magneto might also occur on a modern high tension one. The trouble occurred on a medium powered touring car during what had previously been a very successful run. The engine had been pulling well, but suddenly the engine began to misfire badly, and finally, after running some distance in this way, came to a dead stop. To those unacquainted with the working of

the low tension circuit it may be here explained that faults with this system are usually accompanied by immediate total cessation of firing, the explanation of this being that should there be a short circuit (and this is the most usual fault) no spark can take place at any one of the igniters.

Thus it was that the fault was at first attributed to the carburetor, but on examination all seemed to be in order. Next the magneto was examined and found to be faulty, no current being generated. The explanation was, however, not quite clear, for the engine had at first only misfired. The magneto was dismantled and the defect soon became evident. The end of the armature winding had become disconnected from the slip ring, and, owing to the vibration of the car, would at times complete the circuit and at others break it. The final stoppage of the engine was accounted for by the wire falling away from the slip ring altogether. Upon this defect being made good the engine again ran as well as it had run previously.

LITTLE MECHANICAL NOTES.

Good for Repair Men and They are Likewise Useful for Car Owners or Drivers.

From J. N. Bagley, Nebraska.—Some time in our lives we have presented to us the golden opportunity of a life time, and it is but one chance in ten that this opportunity ever comes to us again. If it should there is gen-

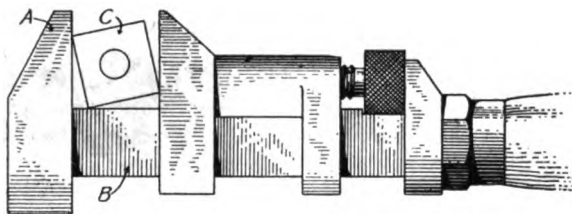


Fig. 1.

erally a lacking of some important point concerning the welfare of ourselves. Ordinary opportunities may come to us daily, but the golden opportunity of a life time presents itself but once.

To the mechanic of ability and "ginger" the opportunity to take hold of the auto repair business today is the golden opportunity. If this is neglected some one must open a shop for the repair business. Why? Because the public demands it. When the public demands a certain thing it is sure to get it. Some one has to look after the repair business and if you turn the job down it is up to some one else to do it.

The demand for good repair men is sharp. The writer has been in the business nine years, and before this served time in the machine shops. Good help is hard to get. There is the graduate from school, the six weeks' fellow who comes to you telling you he has a diploma. I have tried some of them and in my estimation not one can do a job fit for anything. I have all sorts of experience with the school students and have been in partnership with one of them. One of these fellows came to me and told me he could do any branch of the work such as lathe and shaper work. I inquired of him how he was on the magneto and soon raveled a skein of stuff about the schools and finished by saying he would just like to try and if he did not make good asking nothing for his services. Of course this was a fair deal and to do my part I had to give him a chance. I had a magneto that was taken down (entirely down) and I turned the job over to him. He worked two days and the longer he worked the worse things got.

On Friday of the same week he got the machine together and placed it on the car. He spent the most of the day in cranking instead of looking the matter out and removing the trouble. After three or four more hours he somehow got it started and every time he advanced the spark to running position the motor would stop. So long as the lever was in a retard position it would do very well. We finished the week on the magneto, and with the rest of the men I paid him off and told him to come over Monday and finish the job. I was anxious to know just what a man learned at these advertised schools, or whether they belong to the "graft" class.

On the following Monday he came back and worked until Thursday and gave up the job. The fact of the matter was, he failed to time the distributor of the sec-

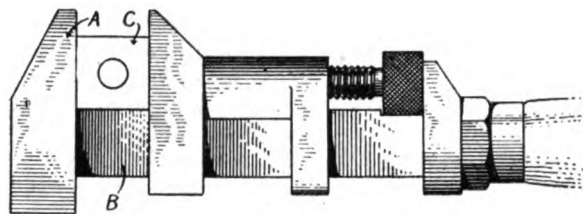


Fig. 2.

ondary circuit with the breaker points. While running on the retard position the magneto did very well, but when the advance position of the breaker box was used the points gave the spark while the contacts on the secondary distributor lacked about three teeth of being in position to take the current to the plugs. Had they been close enough so that they could have jumped across the motor would very likely run in a way, but as it was he made a failure of the job.

The writer at different times has tried many so called "experts" who have received their education by the theory route, and has come to the conclusion that the terms are entirely too short. If these students were kept at school about six months they would be better mechanics, and the schools would have a better reputation over the country. Of course, as we all know, there are young men and boys who have a natural talent for mechanics

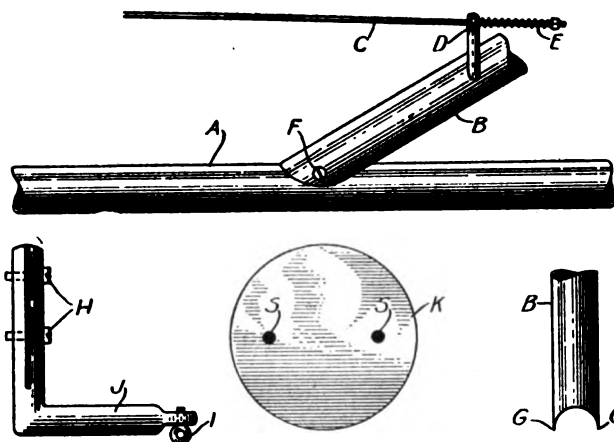


Fig. 3.

that do exceedingly well, but where one succeeds many fail.

One of the things one should learn in the beginning, and a very simple one, is to use a wrench that fits the nut. In Fig. 1 we have the wrong use of the wrench. At C we have the nut that does not fit the jaw. This has a tendency to bring the strain at the point of the jaw A, thus springing back the shank of the wrench B. In Fig. 2 the nut C fits perfectly, therefore the strain at A and B is equally divided, and if the strain is great

enough the bolt can be twisted entirely off without damaging the wrench in the least.

Fitting a Shop Made Cut-out.

Hardly a week goes by but some one is wanting a cut-out placed on his car. Now if one were to carry in stock all the sizes in cut-outs it would involve quite a little cash, and besides there are some sizes that are slow sellers. For some time the writer has made all the cut-outs he used and finds the plan to work just as well, and in some respects better, than the cut-outs on the market. It is necessary to carry in stock a few sizes of light seamless tubing. This will cost scarcely nothing. In Fig. 31 we have the plan for making this cut-out valve. B is the extension in which the valve is placed. This should be made about as heavy as the exhaust pipe and cut in such shape as to saddle over the exhaust pipe at points G, G. The hole cut through to the interior of the exhaust pipe should be just as large as possible. After this has been fitted on and pinned as shown, one can be brazed with a blow torch. Next in order will be the valve, which is made of a piece of sheet metal, exactly round, or as near as possible to get, and this answers for the valve. J shows the lever sawed out to allow the washer to slip between the shanks after it is slipped in to the pipe. Through this drill holes H H to correspond with the holes S S in the disc K and fit a screw in each of the holes. This allows the disc to be placed when it is ready to assemble. As shown, a wire leading from the

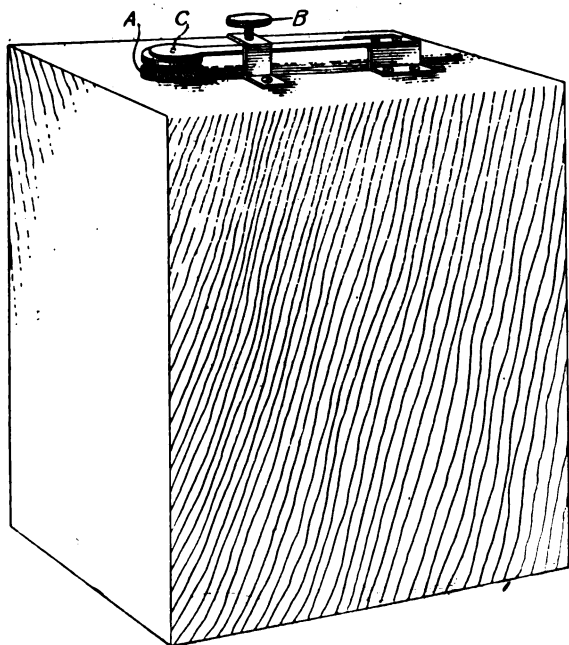


Fig. 4.

lever at I to the foot pedal will serve to pull it open at C. This wire is tied to the little lever D with a little spring E, which pulls the valve shut and holds it when the foot pedal is released.

I have made and used the pedals for over a year and have never had a minute's trouble with them. Cars have come many miles to have one of these cut-outs put on. There is one advantage in this sort of a cut-out, it does not require cutting apart the exhaust pipe. These valves should be placed at the most convenient place that can be located on the car. On a Ford car it is located just across from a line with the narrow board at the back of the mat, and the little lever D should be fitted to work crosswise instead of lengthwise. The foot pedal can be placed on this little board.

A Kink for Vibrating Coils.

At different times I have had Ford cars come to me for repair that would run well at a high speed, but when throttled down to six or eight miles an hour would go nudging along, running on first one then the other cylinder. Many different men had worked on the car. Some had attributed the trouble to the mixture, and some to one thing and some to another. After testing out the different parts which could affect the motor in this manner, I decided it was in the coil. The treble springs would work well at a high speed but at a low speed it was very faint in the buzz, and at times would fail to buzz until the spring was tapped with the end of

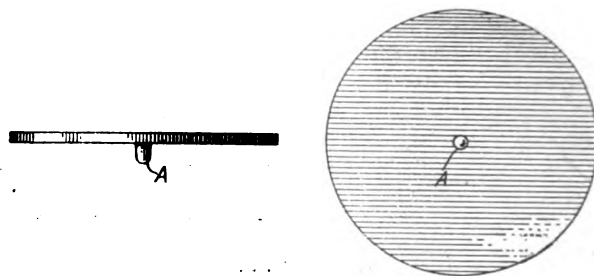


Fig. 5.

the finger. After trying many different things I decided the treble spring nose was too far from the core of the coil and would not attract at a low voltage given from the magneto.

To remedy this I turned four small washers and placed them on the nose of the treble spring as shown at C, Fig. 4. This reduced the space between the spring and the coil and a very low voltage would attract the spring. This not only removed the trouble, but the car never before cranked as easy, I was told some weeks after. This little washer should be placed on the spring as shown in the illustration Fig. 4. Where the space was too far in adjusting the screw B, it was impossible to force the nose of the spring down to the core without making the tension so strong that the spring could not vibrate. A, is the core of the coil, and the washer should be just the same size and should be fastened with the little pin left on the washer as shown at A, Fig 5. This can be made in a lathe in a very short time by using a Bessemer rod the proper size in diameter.

I have repaired many coils in this way and have yet to have the first one bother after the little buttons were placed as described. There are certain makes of coils that do not need this particular addition, and one should be sure that they do need it before placing them. The unit may be tested with two dry cells and if the treble spring will not vibrate the space is a little too far and the addition of a small thin washer should be added until they will vibrate freely on three volts, as this is about the extent of the voltage when cranking on a magneto of this type, unless the motor is "spun," so to speak.

Third Naval Power.

The United States navy, according to official reports, last year continued to occupy third rank among the great navies of the world, being outranked only by those of Great Britain and Germany. In the number of battleships only Great Britain's navy is superior to ours. The Powers rank thus as to their naval strength: Great Britain, Germany, United States, France, Japan, Russia, Italy, Austria-Hungary.

Subscribe for the Automobile Dealer and Repairer.

SAM'S DIFFICULTIES.

How He Overcame Them, and By Doing So, Incidentally Learned Much.

BY O. H. HAMPTON.

"Hello Sam, where have you been for the last two weeks?"

"Been at home putting in that new motor," answered Sam. "Guess it would be a good story for you to write in *The Dealer and Repairer*."

"Tell me all about it," said I.

"Well, trouble began with the arrival of the motor. The intake and exhaust pipes were not sent and there was no starting crank, either. The motor you know, is a two cylinder to be set crosswise in the frame. As the thing weighs 400 pounds, I got Howard Purviance to help me, and the first day was used up in getting the thing set and fastened in place and after that I went it alone. The next thing to be done was to put on the intake and exhaust pipes, but while waiting for them to come I connected the wiring, bolted the transmission to the fly wheel, and did the other dozen of things that were a part of the job. When the pipes arrived I put them on in the usual way, that is, with the intake pipe in front and exhaust in the rear. The motor was now ready to run as soon as the timer was adjusted.

"To get the right position for the timer, I took the spark plug out of the right hand cylinder, and also took the plug out of the top of the crank case, so there would be no compression except in the left hand cylinder; then, by cranking I brought the piston of the left hand cylinder to the end of its compression stroke, and marked the projecting end of the crank shaft so the position of the pistons could always be determined by looking at the mark. The timer was already on the cam shaft and in the proper position with reference to the spark lever, so after turning the crank a little until the piston was just past the dead center, that is, just a trifle beyond the completed compression stroke, I turned on the juice but there was no buzz.

"Now the next thing to do was to release the sleeve of the timer from the cam shaft, rotate it on the shaft until there was a buzz and then learn which cylinder the buzz was for, and if it was not for the one in the firing position, turn the sleeve until the next buzz came for the other cylinder. Then fasten the sleeve securely to the cam shaft by means of the set screws.

"After I did this, I cranked, but the motor didn't start except to kick back and blow back through the carburetor and do various other mysterious things that couldn't be accounted for. I cranked myself into a hot old August sweat, and finally said things that seemed appropriate to my frame of mind at the time.

"I was sure that everything had been adjusted exactly right. There appeared to be nothing more that could be done, so I concluded to give the bloomin' thing one more cranking and if that didn't start something I would drop it and write to the man that planned it and ask him to please rise and explain and do it quick. At that turn of the crank that imp of total depravity kicked back and kept right on running backward and doing it just like it had been raised that way, except there was a lot of popping and blowing back through the carburetor. As running the wrong way was no good, I just let it go for the present as I was in no fit frame of mind to tackle as intricate a problem as that was.

"A little before sundown Howard Purviance came along and I called him in and explained my troubles

and asked him to tell what was the matter, and if he couldn't do that, to at least sympathize with me. He looked the thing over and said he wondered if the cams were not set for putting the intake on the other side of the motor. We both agreed that although we had seen scores of motors we had never seen one with the intake on the rear side but that such a thing was possible. I told him we would let the matter rest for the present, and in the morning I would set myself the problem of the theory, and then try to prove it in practice.

"That night in spite of the worry and the humiliation of defeat and great bodily fatigue, I slept a sleep that was nigh unto death and awoke next morning fully rested, full of resolution to get the drop on that motor. The first ray of light came when I remembered that the intake side of the motor would be sucking gas or air in, and never ejecting either gas or air, and that the exhaust side would never be taking in but always ejecting. Acting on this thought I hung small sheets of paper over the open ports on both sides of the cylinder and cranked. The compression stroke happened to come first when the motor was cranked. There was nothing doing at either port. The explosion stroke came next; nothing doing yet at either port; the sheets of paper did not move.

"Next stroke would be exhaust, and the paper was due to be blown away from whichever was the exhaust port and it was blown away from the port which I had considered the intake when first trying to assemble the motor. Immediately after came the suction stroke, and the piston had but little more than started on this stroke when there was a sharp report like a boy 'popping' a paper bag. The suction was so strong that it ruptured the paper.

"That settled the matter. The intake belonged on the rear or fly wheel side of the motor. Trying to put it on that side was the next job of worry. On account of the small room between the fly wheel and the side of the motor it looked impossible to get the carburetor set low enough for a gravity feed from the gasoline tank, but it was finally contrived. Next time the motor was cranked it started at such terrific speed that I jumped for the throttle at once for fear the thing would fly to pieces. I tried it enough to make me feel confident that this motor will never feel the difference when it yanks the car over Oil Mill Hill, or any other old hill around here.

"The worst part of the job remained yet, and that was contriving how to arrange the exhaust pipe. The exhaust ports being on the front side of the motor, and the motor being almost directly over the front axle, and not room enough for the car springs to work right and on account of the water hose being in the way, the only thing that could be done was to bend the pipe a half turn so it would fit the side and bottom of the motor, and it is no easy thing to bend inch and a quarter steam pipe when one has no appliances for bending pipe. The way to do it when there is no better way at hand is to fasten the pipe in a strong vise, thrust a piece of steel shafting almost as large as the bore of the pipe, into the pipe to where the bend is to begin, pull on the projecting end of the shaft until the pipe is slightly bent, withdraw the shaft a little and bend again, and so on until the bend is finished. Care must be taken to get the bend just right as you go for there is no doing anything with it afterward. It is best to bend a small rod or heavy wire to the required shape for a pattern, and test each short bend by the pattern as the work progresses.

"Now I just want to tell you that the job cost me a lot of time, worry, and a lot of hard work, and at the time it seemed like I was in pretty deep and not in good form for swimming, but now that it is all over, it don't

look so rotten bad and I feel that what I have learned is an asset that will be valuable in the future; besides that, it didn't cost me money. If I had taken the job to some amateur repair shop it might have been done as well as I did (possibly better), and perhaps not as well, but in either case it would have cost from \$25 up."

THE NEW CARS.

Constant Improvement from Year to Year and 1913 Models Best of All.

The prospective buyer of a car must not think because the 1913 car looks very much like that of 1910 or even like that of 1912 that the manufacturer has been asleep or that he has not worked hard for greater satisfaction and a nearer proximity to the goal of perfection. As a matter of fact, this state of affairs is the strongest proof available as to the greater value which the purchaser now obtains. It must not be thought because an entirely new chassis is not staged with a different engine, a different gearbox, and a different axle and frame that therefore the said manufacturer has been resting on his laurels and "sitting tight" so far as expenditure is concerned in reference to the work of perfecting his products. No. The actual state of affairs is that very many firms still spend, proportionately to their output, quite as much money in experimental work, and in the labor of perfecting their existing product, as they did years ago when the entire chassis was of new design from year to year. A little consideration, therefore, will lead us to the opinion that the benefits accruing to the new purchaser are very much greater than they were before. Instead of purchasing a chassis, a large proportion of which was necessarily experimental, he and his co-purchasers now pay only for the actual perfecting of the various details in a chassis which has already risen to a marked degree of excellence.

Looking Backwards.

It is necessary for the moment to be retrospective. Carry the mind back some six or seven years, and take the car of those days. What were the troubles? In truth it was but rarely that we entirely broke down through mechanical troubles; that is to say, for an engine to smash up or for a wheel to come off, or for a gearbox entirely to give out, was quite the exception rather than the rule. On the other hand, however, we had continual trouble with our electrical equipment, our carburetion, valve mechanism (those of us who made any attempt to keep it up to its pristine efficiency), clutches, inefficient gearboxes (and very leaky ones), rattling universal joints, brakes which were out of adjustment every other week, and "humming" back axles. But all these things are improving in a most remarkable manner, and a charge of egoism should not be made when we state that the average man can hardly have any true conception of the degree of progress which has been, and is being, achieved. This, then, is one of the many benefits wherein a 1913 buyer gains.

How Detail Improvements are Effected.

Take, for instance, any car which has been very successful on the market during 1912. Well, throughout that season there will have been a certain percentage of troubles, all of which, if the works are properly organized, will be annotated for reference by the responsible heads. For instance, a certain percentage of purchasers will have found such-and-such a trouble in connection with the engine, perchance a

bearing running, maybe an oil pump spindle breaking or a pipe snapping off, a timing chain giving out or the tappet mechanism needing continual adjustment—and so on and so forth. Well, he who is responsible for the design of the engine will have had all these points brought to his notice during the course of the year, and then comes the investigation. "Why did Mr. Smith's timing chain break?" Possibly the manufacturer of the chain is to blame. Examination may show a rivet which is not all that it should be as regards the metal, or it may have been badly put together, or it may be a dozen and one other reasons which may have caused the chain to give out. Assuming this to be the actual case, then, the chain will remain as heretofore. If, however, in addition to Mr. Smith's chain breaking, two or three other owners' timing chains also give out, then the question has to be gone into in a more thorough manner, and perhaps it is found that the work imposed upon the chain in driving the cam shaft, and, perchance, the magneto, is greater than was calculated, and that a little stronger chain is needed to be absolutely safe. Then, of course, in the 1913 model a larger chain is provided. (We ought to point out that we have instanced the case of a timing chain breaking chiefly from the fact that it is one of the last things likely to give trouble on the up-to-date car, if adjusted properly, and it is taken purely as an example.)

Striving for Perfection.

So with other parts of the engine. It may be that a slight defect was noticed by purchasers in regard to the lubrication system—then that is made right. So with the clutch and the clutch-operating mechanism, a number of complaints may be received as to the clutch getting fierce, or, on the other hand, that to prevent it slipping it is necessary to tighten up the springs to such an extent as to make the operating mechanism very stiff. Here again is more work for the designer on the road to the realization of his perfected chassis. On some cars it may be that the gear-operating mechanism gets out of adjustment, and on another it will be that the universal joints quickly begin to squeak and rattle. On still a third it may be the brake mechanism, or (quite frequent this) the steering gear gets tight and stiff. All these defects are gradually eliminated.

There is also, of course, in addition to this means of acquiring information, the fact that the responsible heads of the firm are, generally speaking, using their own cars, and they, of course, also take cognizance of any little defects which crop up and have them attended to, although, of course, the cars which they use are naturally subject to more practiced treatment than is the chassis which goes to the hands of the ordinary motorist.

It is seen, then, how much the new purchaser gains, and every item which is improved tends to be put at his disposal an article which is very much nearer perfection than the car purchasable in the preceding year, although a cursory glance given to the chassis on the stand may reveal but very little differentiation from the one shown last year.

The Unknown Quantities.

Another important field is in regard to the question of renewals. Herein, of course, engineering science has an unknown quantity to contend with in addition to its own particular one, in the shape of the type of treatment which the car will receive. A capable designer may consider that such and such a

size of gear wheel at such and such a speed will transmit so much power with a margin of safety of so much; but at what speed that gear wheel will be jammed into engagement, and with what manner of skill or lack of skill the movement will be effected, he cannot calculate. Consequently, there is also, as a corollary to the scientific work attendant upon designing a chassis, the practical experience not only of the members of the firm but also of the ordinary public. All said and done, it is the practical road experience of the public which teaches the manufacturer what he has to provide for the said public, and therefore the greater his experience and concentration on any given model, obviously the nearer he must get to perfecting that said chassis as time goes on. Therefore the reader must not assume because such and such a company did not produce a new model with an entirely different engine or gear box, or a new something else, that they are not advancing along the ladder of success. In all probability, on the assumption that their car is a fairly sound proposition and that it is an "honest job," they are seeing to it that every ounce of knowledge which they obtain from their purchasers and from their own practical experience is turned into solid advantage for the benefit of future purchasers.

So it is that we ourselves, as from year to year we try different cars, find the few minor defects of one year largely removed, or even entirely eradicated in the model of another. In the one case it may be in connection with the transmission gear or control of a car that it was not quite up to ideal standards, and in another case it may be merely a matter of spring location or chassis length or some kindred small point. As a general rule, however, we find that in the course of time such defects are obliterated, and consequently the purchaser of a 1913 model obtains a considerably better article than the purchaser who bought an earlier pattern of the same car.

Avoiding Side Slip.

Taking corners quickly is the simplest cause of side-slip, and trouble of this nature may, of course, occur even on a dry road on some types of tires if the corner be taken rather fast.

A cause of side-slip which is not so generally understood may present itself when the car is being driven perfectly straight ahead. As long as all four wheels are shod with suitable tires and roll freely over the ground side-slip of this kind will not occur, but if the brake be applied hard one or both of the wheels may be locked and will slip in a straight line. Immediately this takes place the wheel in question loses its lateral grip of the road and begins to slip sideways; otherwise if the road be at all cambered the car will slip down to the gutter. Sometimes this may be avoided to a considerable extent by slowing down the engine or taking out the clutch, and sometimes simply by releasing the brake.

Fortunately side-slip is generally confined to the rear wheels, though occasionally the front wheels will also slide when taking a corner too fast; this latter can usually be overcome by using suitable non-skids both to back and front wheels.

One frequently recurring case where side-slip occurs is driving on a somewhat narrow and cambered road—which may be perfectly straight—and when meeting a vehicle one has to pull down towards the gutter: on turning the steering wheel to resume one's position towards the center or crown of the road, the novice is often surprised to find that the car heads

for the left hand pavement. In such a case he should, of course, immediately take out his clutch and incline the steering in the opposite direction, and refrain from using the brake. He will then retain a straight line, and possibly have learned an important lesson, not only to himself, but to other users of the road as well, that is, never to steer sharply from the gutter towards the crown of the road when the surface is wet or greasy. This equally applies to starting a car from rest as well as in the case mentioned. The cause is chiefly that the adhesion of the driving wheels is insufficient to overcome the centrifugal effect.

Side-slip, however, can be prevented so long as no reckless driving is indulged in, by the use of good non-skid tires.

Cold Weather Troubles.

If your car is not being used this cold weather you, of course, should remember that a few remaining drops of water in the cooling system are liable to do hundreds of dollars' damage. But experience in this matter has been so costly in many instances, and the necessity for care has been given so much publicity, that a word of caution now and then is all that is necessary.

But the most perplexing trouble of the frosty weather is starting the engine. When, for instance, the starting handle cannot be rotated at all, you may be sure that the pump has been frozen, and if you use force you are likely to do damage. If the starting handle be merely very stiff to turn the lubricating oil in the cylinders is probably congealed, which will be remedied as soon as the engine starts and warms up. If this render the engine impossible to start, one can either inject gasoline or kerosene into the cylinders, about half a teaspoonful into each, which will dissolve the thick oil; or the cold water in the cooling system may be drained out and replaced with hot water, which is best of all.

If the crank shaft and starting handle turn as freely as usual and still the engine will not start, the probable cause is the failure of the gasoline to vaporize owing to the extreme cold. To convert liquid gasoline into vapor some heat must be absorbed, this usually coming from the air drawn into the carburetor. If the air is at a very low temperature it has no heat to part with, and in many carburetors vaporization will sometimes not take place, while if it does do so, the carburetion will be bad and the engine will not run well for the first mile or so. One way of warming the carburetor, if the water system has not been filled with hot water, is to fill a rubber hot water bottle with very hot water and hold it up against the carburetor and inlet pipe. If the carburetor is completely enclosed, hot water may perhaps be poured over it, but it must be seen that there is no chance of water entering the carburetor through an air inlet or around the needle valve spindle, or it is bound to cause trouble.

New Form of Swindle.

In New York City, that mecca of adroit swindlers, a new form of swindling has been unearthed which is interesting, and for some time was successful—at least to the tune of a profit of about \$200,000. It appears that one member of a gang would negotiate for the purchase of a car or auto supplies. He might advertise that he would buy a car or might tell a tire dealer he wanted tires for the car in his garage. If he professed to want to buy a car he would show the

dealer a garage full of cars which had been collected from other confederates for the purpose of making a good showing. The buyer would tell the seller that he was ready to make a cash payment but could not pay the balance until after a week or so. For reference he would give the seller the name of a confederate who ran the same kind of fake garage. The latter would vouch for the responsibility of his friend and might even endorse his note. The cash payment of perhaps a tenth of the value of the car would be made. The notes given for the balance would prove to be worthless. Before the notes came due the car was sold, and for a good deal less than its real value.

In the case of a tire swindler, the dealer who sold the tires to one of the crooks got no cash payment, but merely left them at the garage, apparently so well filled with cars, and charged the amount to the firm name of the garage. These tires would be sold within forty-eight hours by the swindler at less than half price and there would be only a civil suit against the garage owner.

THE DOBLE STEAM CAR.

Of the Highest Class, it Also Embodies Some New and Attractive Features.

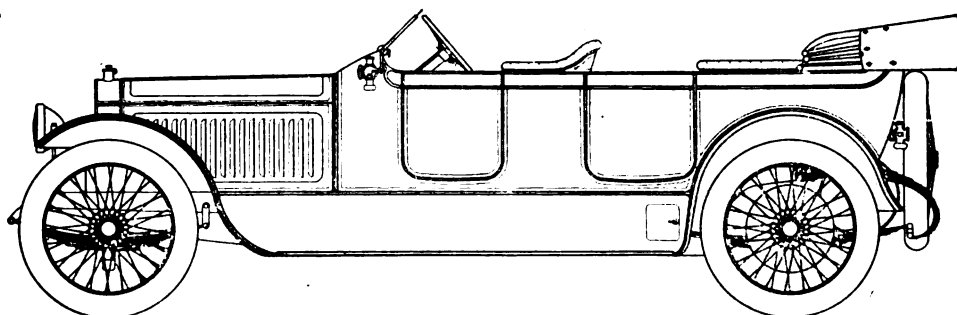
The Doble Steam Car is brought out with the idea of catering to those who wish the highest class in both con-

The bodies are of the latest stream-line type and of absolutely the best materials, and as this concern builds only a few cars, individual wants and ideas can easily be taken care of. The seats are in the position that long road experience calls most comfortable; the upholstery is very luxurious. The hardware and fittings are likewise of the highest class, so that the doors shut with that pleasing click, that tells of well fitted latches.

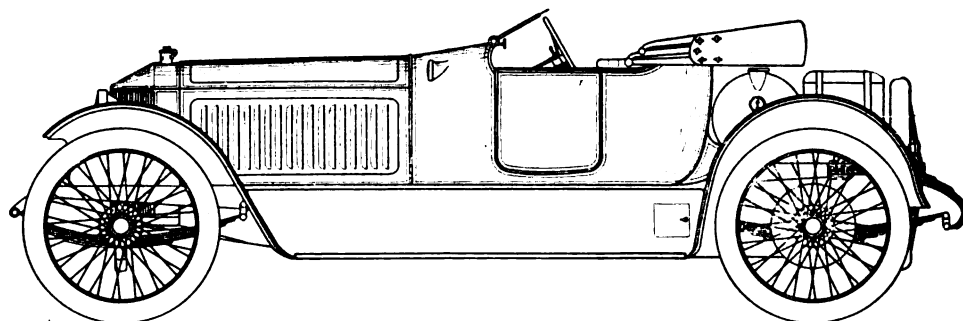
The whole car contains but 28 moving parts, and but 15 of these are in the engine. Moving parts are the only wearing ones, and these are made with extraordinarily ample wearing surfaces. As no change-speed gears or clutch are required, and as the speed of the car is dependent on one small throttle-lever only, the simplicity of control can well be imagined.

Accessibility, also, has been made a special point, with the view to making the car very easy to care for by the owner driver.

Starting at the front of the car and taking each part in its turn, the condenser resembles a radiator on a gasoline car, both in position and shape. It is composed of two cast-aluminum headers, which are connected by many thin, flattened tubes, arranged vertically, with their edges facing forwards. These tubes have no fins, and therefore mud is not liable to collect between them. Flattened tubes are used, because the maximum surface is exposed to the rush of air, and the steam is divided into thin ribbons, thereby being very quickly cooled. A feed-water heating-coil



Doble Steam Touring Car.



Doble Steam Flyer.

struction and appointment. A steam car inherently possesses the very characteristics most sought after by builders of gasoline machines, such as flexibility, reliability, power, comfort and simplicity. Steam machines heretofore have had certain disadvantages, such as, the time required to start in the morning, and stopping for water, in spite of which, a large number of motorists will ride in nothing but a steam-driven carriage. Yet it is claimed by the manufacturer of the Doble steam car that these disadvantages can be overcome to a negligible extent. The following description of the car will be read with interest:

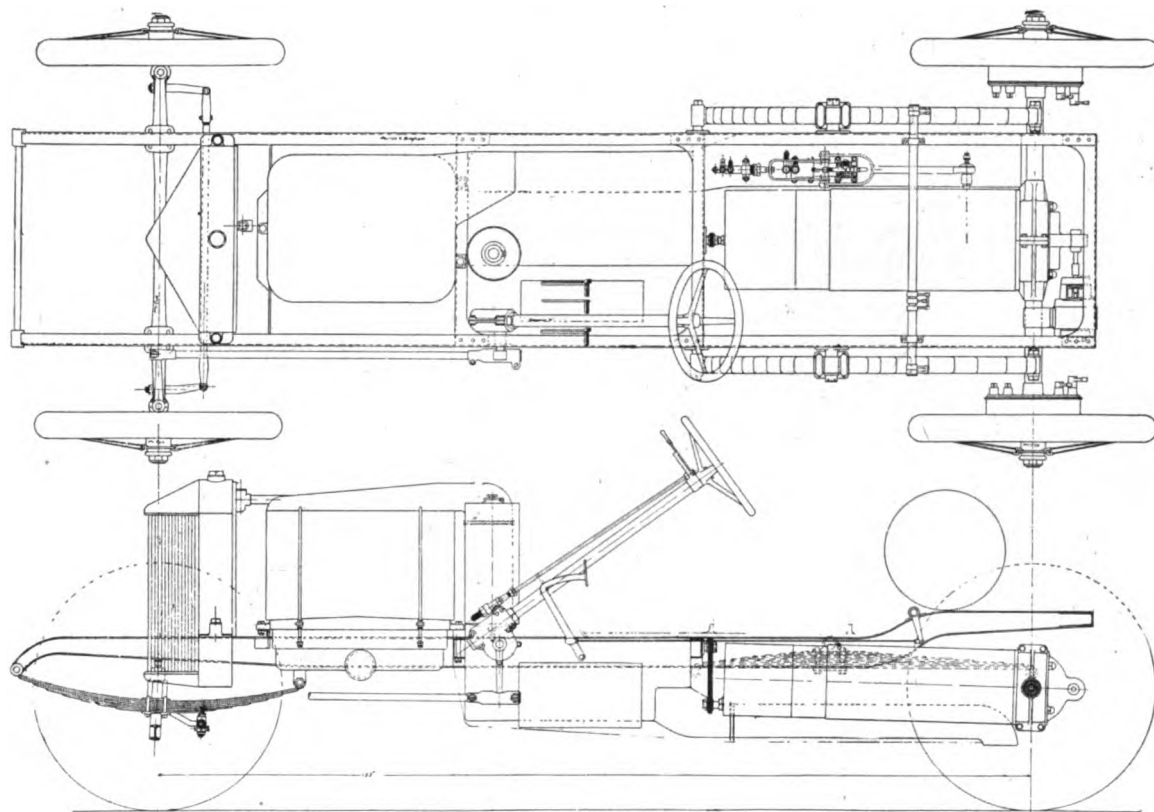
is contained in the top header, and helps condense the exhaust-steam, as well as to heat the feed-water which goes to the boiler. The steam in excess of the capacity of the condenser, flows out of a non-return valve into the boiler-flue, and is thus heated so that it is invisible when it escapes to the atmosphere. At a normal speed, the condenser takes care of all of the exhaust, and by making a partial vacuum in the exhaust pipe, it adds to the economy of the car.

The boiler, with the burner attached to its under side, is situated under the bonnet, just back of the condenser. This boiler is of the semi-flash type, and

is made with a large capacity for ample reserve power. The casing is well lagged with asbestos and magnesia to retain the heat, and the lagging is covered with Russian iron. By means of a regulating system, which has been the basis of experiments covering a number of years, this boiler is given the same reserve power and steady steaming qualities, that have long

or fuss required to get this machine ready, is all that is needed to turn two small valves a half a turn.

The first valve allows fuel to flow to the pilot, and at the same time sends electricity from the storage battery to the pilot heating coil. The other valve allows fuel to flow to the main vaporizer, but on account of the construction of the vaporizer, no fuel can



Showing side and top perspective of the Doble Steam Two-Seater.

been the particular virtues of the fire-tube boiler. This does away with all need for change-speed gears and clutches, no matter what the conditions of running. There are no fusible plugs, water gauges or temperature gauges, and the only instruments appearing on the dashboard, aside from the speedometer and clock, are the steam gauge, air gauge, and "oil blinker." These gauges are not necessary to the operation of the car, but if anything ever gets out of order, they are a ready means of diagnosing the trouble. A machine with this boiler has been repeatedly driven a distance of $3\frac{1}{2}$ miles, without allowing any more water to flow to the boiler, and nothing more serious happened than a drop in steam pressure at the end of the test, when nearly all of the water had been used. On allowing the water to again feed to the boiler, it performed its function as well as ever. To safeguard the boiler in the hands of the amateur in the event of an interruption of the water supply for a protracted period, a shut-off valve is arranged to cut off the fuel to the burner, when the water in the boiler is exhausted.

The burner is built on the bunsen principle, and will furnish a maximum of 75 h.p. which is greatly in excess of any possible requirements. This burner is started by a combined heater and lighter which uses electricity from the lighting system. This device does away with all the fuss and bother of "firing-up" a steam car, and for the first time one can get into the driving seat, steam-up, and be out of the garage in less than 3 minutes. The amount of labor

flow through it until the pilot has heated it sufficiently to properly vaporize the fuel. When the pilot has started, the first valve is opened another half turn, which shuts off the current, but allows the fuel to flow. The pilot begins to burn blue in 45 or 50 seconds after the electricity is turned on. In case the fire should go out from any cause, the main vaporizer cools and shuts off the fuel, thus making it impossible to "flood the burner." Once fired-up, the machine is ready to go at any time, and in winter the pilot may be left burning all night, which in unheated garages effectively prevents damage from frost.

The oil tank is between the boiler and the dashboard, and will hold 4 gallons, sufficient for 1,500 miles.

The water tank is beneath the floor boards, in the middle of the car, and holds sufficient water to enable the car to run 250 or more with one filling. The water of condensation is pumped into a chamber in the water tank, which entraps the oil. This oil is floated off automatically every time the tank is filled. The tank can be filled with a garden hose, or by means of the steam syphon with which the car is equipped.

The engine is under the rear floor boards, in a horizontal position and is bolted directly to the rear axle, forming a compact unit with it. The front end is supported by a six-leaf spring. This position and method of hanging the engine, effectively prevents the engine vibration being felt by the passengers, at any speed of the machine whatever. It is also very

efficient, as there are no universal joints or bevel gears to waste power. The engine is of the locomotive type, having two, high-pressure, double-acting cylinders. The bore is 4 inch, and the stroke is 6 inch. The valves are of the sliding type and are under the cylinders, so that no water can pocket in the cylinders when the car is first started. They are actuated by a "joy" valve gear. This gear is used because it has no eccentrics, and the crank shaft can therefore be made of a single piece of stout forging. Another advantage of placing the valves below the cylinders is that the cylinders are then close together, and the frame of the engine is on the outside of the cranks. Which means that not only is the "rocking moment" of the engine very much reduced, but that the engine frame rods being far apart, are more effective in bracing the engine. A further advantage of this construction, is that the main bearings, which are annular roller bearings, can be very quickly renewed without taking anything else apart. The connecting rod big end bearings are also annular roller, and the rods can be very readily removed.

Thus the throttle is always kept well lubricated. The absence of all joints, pins or links in the throttle-actuating mechanism, is a very good point.

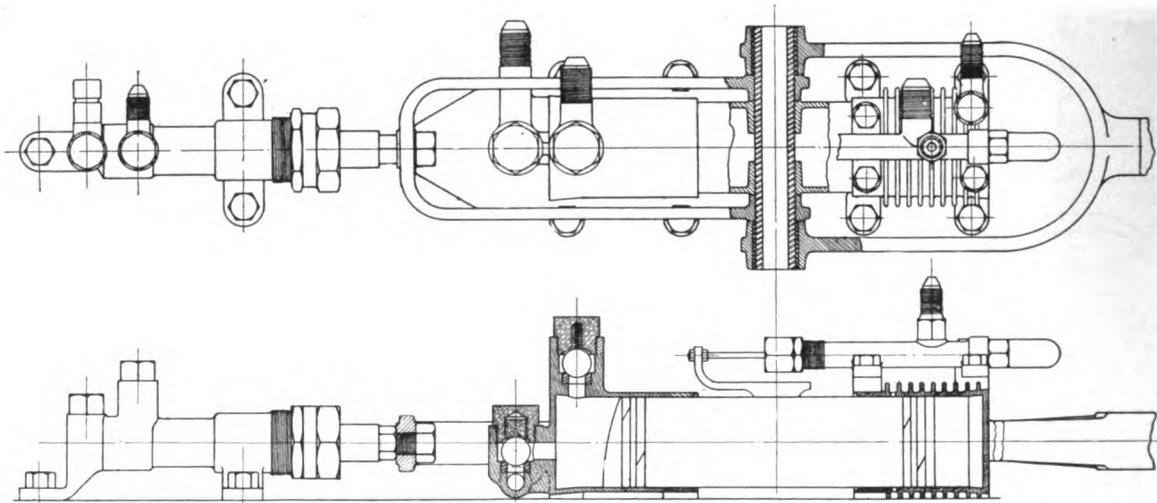
The steering wheel is placed on the left side. There are no side levers, both brakes, as well as the reverse, being operated by foot pedals.

The front axle is a one-piece "I" beam drop forging, with integral tilted spring seats. The weight of the car is carried on ball thrust bearings in the steering knuckles. The road wheels run on imported annular ball bearings.

The rear-axle is $\frac{3}{4}$ floating, and runs on roller bearings. Annular roller bearings on the outer ends, and Timken bearings at the differential, take the thrust. The weight of the car is carried on the axle housing and not on the shaft.

The brakes, four in number, are on the rear wheels, and are all internal expanding, with concentric brake drums. The brakes can be adjusted by merely turning a hand-wheel under the front floor boards.

The frame is made of chrome steel. It is channel section, and upswept over the rear axle.



Showing Tandem Pump Assembly, Doble Steam Car.

The service pumps of the car are bolted to the right side of the engine, and are driven by one rod only, from a roller-bearing crank on the engine shaft. Since the pumps are fastened to the engine, no vibration or noise can reach the passengers. The pumps are enclosed in an easily removable copper case. In winter the warmth of the engine keeps the pumps from freezing. Ball check valves are used in the pumps, and the valve seats, which are pressed in, are made of a special non-rusting nickel steel. The air pump furnishes the fuel pressure, and the amount of this pressure is regulated by the clearance of the pumps, which is set for 50 pounds.

The fuel tank holds 35 gallons, and is hung just behind the rear-axle. The throttle valve is bolted to the steering gear housing, and its stem runs up the steering column. It is surmounted by the throttle lever. This lever is easily operated by the first and second fingers without removing the hand from the steering wheel. The throttle valve is of the screw-in type, and the sextuple thread as well as the valve seat, is made of special nickel steel, which does not rust or corrode.

The cylinder oil is pumped through a "blinker" on the instrument board, and is then led into the throttle.

The front springs are semi-elliptic, while the rear springs are of the cantilever type, which makes an exceedingly easy riding car.

Detachable wire wheels, with spare wheel, are standard equipment, but artillery wheels will be supplied if desired.

The instrument board is placed in the scuttle, nearest the driver, and not only are the electric light switches very handy, but on a gloomy day the board is much easier to see.

The lights are all electric, current being derived from a dynamo storage battery system.

There are no hand pumps on the car, but in their place is a small electric motor, which drives either a water pump for replenishing the boiler if occasion demand it, or an air pump, which is used to put pressure on the fuel tank, after the tank has been filled, the air pump using only 120 Watts (6 Volts, 20 Amperes), while pumping against 100 pounds pressure, which is more than is required for its purpose. This pump is used to inflate tires, and will run steadily for 3 or 4 hours at one battery charge. It takes about three minutes to inflate a tire.

The wheel base on the two-seater is 133 inches, and the tires are 36x4 $\frac{1}{2}$ all round. This car lists for

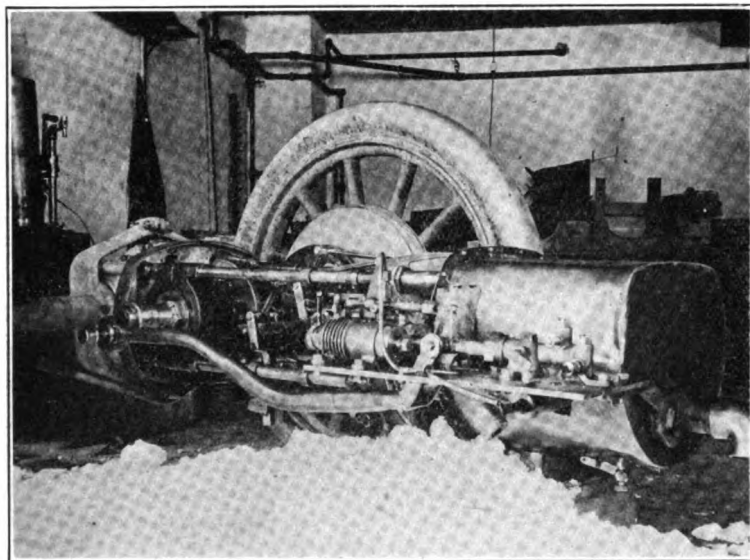
\$3,500 with complete equipment. The wheel base on the touring car is 140 inches, or longer if required. The tires are 37x5 all round. We cannot state the price on this chassis at the present time.

The two-seater is geared 61 to 60, or a little better than one to one. The touring car is geared either 42 to 60, or 48 to 60. Even with this high gearing, the engine has sufficient power to slip the wheels on dry ground if the throttle be opened wide while the car is standing.

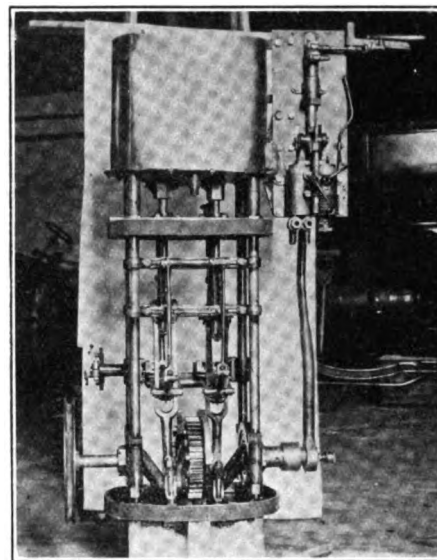
This firm makes an interesting guarantee; it is in effect as follows: That for three years, any part found defective will be replaced without charge for parts, material, transportation of parts, or labor. Also, the

for the keener critical judgment of the car using public everywhere in evidence. At the late Madison Square Garden and Grand Central Palace Automobile Shows the fact was convincingly manifest that colors, after all, are, next to the magnificent finish, the major painting features of the 1913 car. You could hear more people making comment and comparisons relative to colors, as displayed at these two leading American shows, than ever before.

The flaming reds were, for the most part, conspicuous by their absence. This, in itself, is encouraging evidence of an increasing appreciation of suitable color effects. All red pigments, and especially the lurid reds, tend to increase the apparent size of the



Engine bolted to the rear axle, showing pumps and pump drive.



Looking down upon the horizontal engine.

tire makers' guarantee will be increased 50 per cent. by this company, for tires used on their cars.

The date of the marketing of this car is uncertain, but in any event it will not be offered the public until it has been amply tested, which will probably be in the near future.

CHOOSING COLORS.

An Important Feature of the Painting and Care of the Automobile.

From M. C. Hillick, Pennsylvania.—Choosing the best color, all things considered, for the automobile, is about the most difficult feature connected with the painting of the car.

In this choice the car owner should have his way assisted and influenced perhaps by the expert advice of the painter. If the owner elects to paint his car then he must take the entire responsibility of making choice of a suitable color.

There are at least three considerations to be taken into account in selecting a color for the car, to wit: Is the color durable? Is it an easy color to maintain? Is it an attractive color?

There are, of course, other considerations involved among which is this main one, namely: Does it enlarge or decrease the apparent size of the car and what are its characteristics with respect to showing surface dirt, defects, etc.?

The automobile shows being held in practically all the important cities of the country are responsible

surface to which they are applied. The light reds are, moreover, hard colors to keep looking at their best while in service. Blues of the dark, wonderfully pleasing shades, are extensively used upon the highest class of automobile work.

They are colors, however, that require the finest possible surface conditions over which to display them. Blues have the power of diminishing the apparent size of the surfaces to which they are applied. Kept well protected under plenty of varnish and they are certain to wear like the traditional "all wool and a yard wide."

The light blues have the property of minimizing surface defects. Such blues are classed as neutral in their effect upon the size of the surface supporting them, and they are also least affected by the varnish used to protect them.

Grays continue to be popular as well they may, for they are not only very durable colors, but they are negative in their effect upon the surface, and they do not show surface defects to the extent that most other colors do. They are classed as all the year round colors, being cool and restful in summer without conferring an Arctic sensation in Winter. Ordinary methods of handling fetch them through to a finish without finger marks or discolorations. Because of their modest, quiet tones and their exceedingly good looks the gray pigments are to continue popular for runabouts and touring cars.

The dark, beautiful lakes and maroons are colors which the style creators are annually making finer,

and, if anything, more desirable. The lakes have no deceptive properties, hence the surfaces displaying them are made neither larger or smaller in appearance. The main disadvantage of the lakes to the man desiring to paint his car is that they one and all require a surface absolutely without defect. Ground colors are necessarily used under the lakes to support them, and even these must be brought up without blemish for where the ground surface is out of order there the final color is forced likewise to fail. If choice is made of any of the lake pigments the services of a professional painter had best be invoked to arrange for and apply the pigments.

Greens and blacks have the capacity to diminish the apparent size of the surface, the blacks being notably active in this respect. The greens and blacks greatly intensify surface blemishes for which reason their use should be confined to the highest class of work. They are durable colors when kept well protected under varnish.

Browns of the dark, brilliant type are being made much of on the show circuit, and they are quite certain to be greatly used by discriminating painters. They are colors which are quite as suitable for summer as for autumn or winter wear. Being strong covering colors they are easily brought through to the right color and density. To the owner who wishes to paint his car the browns offer advantages which cannot be looked for in the handling of blues or lakes. They do not show surface defects prominently and they are easy to keep in order during active service.

All these colors, when the car gets out into the turmoil of service, need good care and attention. They should be kept under a rich garment of elastic finishing varnish. The surface needs to be washed frequently and it should never be kept in quarters devoid of thorough ventilation or of good light. An absence of light tends to darken the colors and inadequate ventilation affects the finish injuriously. All colors whether here mentioned or not, need strong and fine foundations to support them and give them life and length of days.

How He Avoids Trouble.

From George A. Bailey, Michigan.—I have been able to avoid any trouble in the 5 years I have run my Jackson car. My car is right when it leaves my home and has always come back on its power, and runs as fine and still as when new. I run it myself as well as keeping it in order. I don't try to climb telephone poles or do any funny stunts, or other fool things. I have never even had a puncture yet. I am giving your book the credit of being able to keep my car in such good shape.

Interesting Advertising.

From Dr. J. W. Leininger, Michigan.—Not only is your "Trouble Department" of great value to me, but the advertising pages are very interesting and enable me to keep abreast of the times in the knowledge of new devices and inventions.

Let pedestrians remember that if they attempt to cross busy streets at points other than corners, they do so at their peril. Let them further remember that city streets are not country roads, and that when crossing streets, they should not be deeply interested in talk or gossip.

CLOTHING AND FOOD.

Attire for Cold Weather and What the Car Driver Should Eat.

The subject of suitable attire for cold weather has not received the wise thought its importance calls for. It is not clothing that keeps us warm so much as the atmosphere. While it is true that air cools the body, it does so only when in motion. In other words, a cold air current extracts heat from our bodies as it passes over them, but if it be trapped and kept at rest it becomes a valuable protective medium. It is important that one's garments should be a fairly easy fit, for if too tight they impede the circulation, and if "baggy" every movement causes air, previously warmed at the body's expense, to escape. The material should also be sufficiently porous to allow exhalations from the skin to get away, otherwise noxious gases, are kept in contact with the skin, to be reabsorbed by the system.

The following materials, assuming them to be of equal thickness, have warming properties in descending order: Fur, raw silk, sheep's wool, cotton twisted silk, and ordinary cloth. Fur gives the best results when it is worn outwards—that is, with the skin inside, in which case it is one of the finest methods known of defying cold winds. Furs have also the additional advantage of being considerably lighter than woollen garments.

But it is not enough to clothe the body warmly, for no one can be really warm with cold hands and feet—especially the latter. The best sort of gloves have but a single compartment for all four fingers—as they are then able to keep each other warm—and may be worn double if desired: say a loose material underneath and a close texture, such as silk or kid, outside. As for the feet, they should be warmed first of all before putting on the boots or shoes, as, if one start out with cold feet it is very difficult to get them warm again. The foot gear should have a supple sole, preferably flexible skin or leather, and an extra pair of socks is advisable in frosty weather. For overboots, fur lining is excellent.

Don't get into the habit of "toasting" yourself over a fire; while certainly warming you at the time, this practice makes you "soft" and less fitted to endure cold draughts. Avoid perspiring out of doors, if possible, for there is no easier way of catching a chill. Wash the whole body frequently, as this promotes the necessary discharge from the system of waste products which otherwise clog the pores and lower the powers of resistance to ailments. Get warm, and keep warm by exercise, if possible, as free circulation of the blood is all that is required.

Never is correct diet more advisable than in cold weather, ranking, indeed, equally with clothing. Some interesting experiments carried out show that a couple of candles consume 22 ounces of carbon in twenty-four hours, a similar quantity being required for a man in the same period. Now, the heat given off by an adult is equivalent to that produced by two candles, so that in cold weather each individual should eat $1\frac{1}{2}$ pounds of carbon-containing foods, such as sugar and farinaceous diet, in addition to ordinary food.

Alcoholic stimulants should be avoided, as their action is but momentary, and leads to a subsequent reaction that depresses the system to a lower point than that from which it was sought to raise it by taking the stimulant.



This department is intended as a "trouble clearing house" for car owners, dealers and repairmen. Inquiries in relation to marine motors will likewise be answered as they are of interest to car owners and others who use the two-stroke cycle engine.

Readers are requested to make criticism and comments or to freely discuss any subject of interest to the automobile industry, and to add information of their own experience in remedying troubles.

Inquirers are asked to give the fullest information in every case so that replies may be made intelligently, and thus be of interest not only to the inquirer but to others.

1056 Place for the Transmission.

From Emery Sanford, Iowa.—Where is the best place in the construction of an automobile to place the transmission, of the selective sliding gear construction? Is it at the rear axle or about half way between the rear axle and the fly wheel, or at the fly wheel? I have heard some here claim that at the rear axle is the proper place for it, and then some claim it gets too much strain and vibration there and should be located at the fly wheel so as to be carried on the springs, and still others claim it is best to have it about halfway between the two places mentioned. What I would like to know is this: Does it make any difference where it is located, provided it is put in right? And if it does, where is the best point, and what are your reasons for your conclusions? I trust I shall be favored with an answer in your valuable paper.

Reply.—We believe the best location for the transmission to be as near the motor as possible no matter whether the car is shaft or chain driven. Wherever located it should be so supported that the crank shaft and driving shaft in the transmission are kept in absolute alinement under all running conditions. Our conclusion is arrived at from the reason that alinement should be more easily maintained with the transmission so located. We do not expect all our readers to agree with us in this matter.

1057 Difficulties of Using Kerosene.

From E. T. Morris, Michigan.—Can kerosene be used as fuel for the automobile? What difficulties are to be overcome in accomplishing this?

Reply.—Kerosene can be used for fuel in automobile engines provided any one can devise a carburetor that will vaporize the kerosene, carburet the air in proper proportions, prevent condensation in the inlet manifold, prevent fouling of the plugs, prevent the noisome smelling exhaust, prevent the products of combustion from getting into the base to ruin the main and connecting rod bearings and several other disadvantages inherent in the use of kerosene, aside from material changes in design of the motor itself.

1058 More Power to Gasoline.

From J. B. Verhage, Kansas.—Please answer this in the next issue. Is there anything that can be put in gasoline to give it more power for use in autos? There is an agent near here who says he has a mixture that he puts in the gasoline to make it give more power.

Also, is there any way to adjust the carburetor on a "1911 Maxwell, 30 h.p., Model EA" to give better results in exploding. With the setting from the factory it will

miss in cold weather for the first mile. Then after warming up it shoots regular. I think the carburetor is one of the company's own design.

Reply.—Honestly we do not think it possible to add any chemicals to the present gasoline being marketed that will increase its volatility or power, and yet be safe to use. The cause of missing is due to the heavy gasoline now on the market. We do not believe you can better the adjustment of the carburetor to improve the volatility of the fuel.

1059 Water as a Carbon Remover.

From Ephraim P. Arnold, Jr., Connecticut.—I have one question I should like to have answered. Is it a good plan when your engine is well warmed up to feed warm water through the air intake to the carburetor, in order to remove carbon? I have been told that one pint (I think) of warm water fed to the engine in this way was a very effective carbon remover.

Reply.—A little water fed into the inlet manifold above the carburetor may help to loosen up carbon deposits, but we do not believe water should be fed through the fixed or auxiliary air intake. A few tablespoonfuls of kerosene should be very much more efficacious.

1060 Cleaning the Cylinders.

From W. L. Jackson, California.—I have an Oakland "30," 4 cylinder, 1912 Model. The engine runs tough on high gear and chugs badly when running slow. I think I have been using rather heavy oil and that the engine is gummed. Now, my question is, can I clean it without taking it apart and cleaning it by hand? If so, please tell me in your next issue just exactly how it can be done and oblige.

Reply.—We think it hardly possible to do a thoroughly satisfactory job of cleaning accumulations of carbon in your cylinders, valve chests and piston ring slots, without taking the cylinders off and probably pistons and connecting rods, the object of the latter being to remove accumulations of carbon inside the piston heads. If you will use about a tablespoonful of kerosene oil in each cylinder once a week or so putting it in through the inlet manifold or priming cups while the motor is hot, its use will help to prevent carbon accumulations by dissolving the gummy mass. A little water will also soften up the accumulations, a few drops being let into each cylinder when hot, after the motor is stopped. Care should be exercised not to use too much water.

1061 Results of Heavy Gasoline.

From F. H. W., Massachusetts.—I would like to ask your advice in regard to my car. It is a Model L D Maxwell, two cylinder, 16 h.p. My trouble is to find a carburetor that will not choke up and flood on opening the throttle, after slowing down. I have tried Schebler, Stromberg, Air-Friction, Maco and Maxwell carburetors, but all act alike. Do you know of a carburetor not likely to do the trick of flooding? What would you think of putting a carburetor to each cylinder? How would two Kingstons do for such an experiment? When working right, the car runs splendidly, good for 35 miles per hour, but I find the choking business very annoying and sometimes dangerous. For instance, when trying to get over a railroad crossing when a train is approaching. I have read your magazine thoroughly and know some things you may say in regard to the flooding, its causes, etc., but think mine is worse than any I have read of.

Reply.—There are thousands of owners of double-opposed motors "in the same boat" with you. The principal cause of the "loading up" of the inlet manifold is

the very heavy gasoline now being marketed, and this heavy fuel makes double-opposed motors extremely hard to operate. Your best remedy is either to purchase 76 degree gasoline, if you can, and pay 50 to 60 per cent. higher price for it, or use a smaller carburetor, one that has a higher air velocity and in which all the air both for fixed and auxiliary air supply is from a jacket around the exhaust piping or manifold. Two carburetors could be used, but in this case even they both should be of less capacity than when the car was new and more volatile gasoline was easily obtainable, they should be installed so that gasoline cannot become "trapped" in the inlet piping, and hot air will have to be supplied through a carburetor that uses cold air for neither fixed nor auxiliary supply. We can not advise you as to what carburetor to select. We do not believe that any carburetor will help you except you pre-heat all the air, use 76 degree gasoline, or have the inlet manifold heated from the exhaust which last would be hardly practical.

1062 A Grinding Grumbling Noise.

From Clarence Dahman, Illinois.—I have a 1911 Hudson "33" that I would like to ask you a few questions about. It has a grinding, rumbling noise in the gears when driving over rough roads. This noise appears to be in the differential gears and sounds like the grinding noise when the engine is missing or running irregularly on lower gears. The most of this noise occurs when one wheel drops in a hole, or in crossing a rough culvert, and when bringing the spring into action it seems as if the differential gears did not run evenly and smoothly. The wheels are tight because in good condition and the differential is well oiled. Do you think this will result in anything serious? I will thank you for any advice you can give me for this annoying noise.

Reply.—A rumbling or grinding such as you describe may be caused by a worn drive shaft bushing, a bent shaft, or anything that allows the bevel gears to run off their pitch line. Any noise or trouble in the differentials should be looked to at once, else it may entail a very expensive replacement.

1063 A Loud Chattering.

From J. Roy McKeever, Indiana.—I have a Model Q, Maxwell, four cylinder, 1911 car. It has developed a loud chattering that seems to come from the motor. When running idle I can roll the engine to top speed, and the chattering is not heard. But as soon as I let the clutch in, it begins with a vengeance. I have tightened all parts such as fenders, dash, etc., that could rattle. I have examined the connecting rods and find them O. K. It is not a continual noise but an intermittent one, and after the motor gets hot, it seems to almost disappear, until I go to accelerate, then it gets worse.

Last spring I had the same trouble, except that the old chatter did not rest even when the motor was idling, and it stopped as suddenly as it began. One day during the summer, it would chatter while running idle, but ceased as soon as the clutch was put in.

The compression is good, have lots of power, and not a miss, but I am getting tired of the noise, and afraid that something will let loose, although it does not get any worse by continual usage.

Reply.—There are so very many places and loose parts that can cause chattering such as you describe that we fear we will not be able to help you much. By using a physician's stethoscope you should be able to tell whether it is in the motor or some part of the car.

1064 Knocking and Heating.

From Clinton Garage, North Carolina.—Please give me a few points on a Maxwell, Model A.A., 12 h.p. I have been running my car about one year. I have never had any bad trouble with it at all, only when I let my motor run idle. When the car is standing still it runs first slow and then fast. When I get in it and race my motor to start off, it seems as if it were switched off, then it will pick up just before it stops. Then when I get in a stiff pull or high speed, the engine has an awful bad knock, as if there was a hammer knocking in the motor. I tore the motor down, put in new piston rings, ground the valves, and scraped the carbon from the cylinders and tightened the crank bearings. I timed it back to fire just past center and thought that would stop the knocking, but it did not help a particle. It knocks just the same with the spark retarded as it does advanced but only does this when in a pull and when the motor gets hot. I also have a great deal of trouble with it heating. It don't seem to do a bit better with the new rings than it did before. I wish you would please give me a few points on this knocking, heating and stopping. I have explained as best I can.

Reply.—A good many inquiries of this sort are reaching us each month. Several appear in our January issue which we advise you to read carefully. The trouble you are experiencing is by no means new, and is caused directly as a result of the very much heavier gasoline now being marketed. This hard-to-vaporize fuel accumulates in the long inlet piping necessary in double-opposed motors in an unvaporized form. This condition is usually referred to as "loading up." The remedy, if any is possible is to use 76 degree gasoline at a probably prohibitive cost, a carburetor with a very much higher velocity to the constant or fixed air supply, preheating all the air used for carburetion, or a carburetor to each cylinder installed as closely as possible to each inlet valve chamber. See other similar inquiries in this issue.

1065 The Law of Least Resistance.

From B. A. C., Iowa.—I would like to ask for a little information about what will make the spark plug jump from the top of the plug to the ground or metal part of the plug when it is about 1½ inches. Why will it not jump across the spark gap in place of jumping there? I had a 1913 Oakland "40," with a Briggs magneto, and it did that with all the plugs, and I put on a new Splitdorf, and it was just the same then. I put in a new set of Soot-proof plugs and they work all right on the start, but I have only run the car a few blocks as yet. The motor is hard to start. It has a Model L, Schebler carburetor. How can I remedy this?

Reply.—The jumping of the high tension current between the plug wire connection and shell is a result of the well known "law of least resistance." It is easier than to jump at the spark plug gap, although there may be a spark at both places simultaneously. The plug gaps may be too wide and this, coupled with the increased resistance due to the compression in the cylinders when the spark is produced, is the cause. At the 1912 New York Automobile Show the Remy Electric Company had an interesting exhibit to show the result of the compression on the size of the spark. A set of your spark plugs were screwed into glass enclosed small cylinders in which was maintained a pressure of 75 lbs. gauge, while another set of plugs were shown in operation at atmospheric pressure. In your case you were unable to tell whether the sparks jumped from the shell to the

cable terminal or vice versa, which is why we so worded the first clause of our reply. We are unable to tell you why your motor starts hard as such a condition may be caused by a great many contingencies. However we can safely say that if your motor has good compression, valves and ignition are properly timed, the sparks for ignition are regularly produced and of sufficient intensity and the fuel is properly mixed with the air in combustible proportions, your motor should start easily. This gives you some idea of what it would be necessary for us to wade through to answer your simple query "How can I remedy this?" However in general we can say that it is quite probable that the very heavy and hard-to-vaporize gasoline is the principal cause for the hard starting and if you will carry a can of 76 degree gasoline for "priming" purposes you may find the operation much easier. In many cases a carburetor one size smaller will make starting easier, due to a higher velocity to the fixed or constant air, and while such a change will give better and more economical operation on low and intermediate speeds, with the throttle wide open there will be a material loss of power. You should follow the directions for adjusting your carburetor, for there is no better method possible than that given by the manufacturer of Schebler carburetors.

1066 Ringing Gears.

From H. E. Lauerbach, Illinois.—Please answer in your next issue as to how I could remedy a ringing of my gears which drive the Remy S magneto of my car. I have set the gears as close as possible so they run freely, and have tried to house them in oil tight, so I could pack them with hard oil, but the space is so close as to make it almost impossible. Is there an oil which I could put on the gears to silence them that would stay a good while, or could I get fibre wheels in place of steel cog wheels? Also please answer how close should the segment in the distributor come to the wiping points of brushes. Should it touch the points? What kind of oil or grease should be used in a planetary transmission having steel bands?

Reply.—One fibre gear is often used in a train of three, and sometimes a fibre gear is used on the cam shaft and a cast iron or steel gear on the crank shaft where no idle gear is used. Fibre gears are not so strong as steel and if used should have a considerably wider face. You are hampering us in making an intelligent reply by not giving the name of your car. There is no oil that will stop the ringing, and to pack these gears with a lime soap lubricant, the usual so-called hard grease, may cause you all kinds of trouble from carbon deposits in your cylinders. The brushes in the Remy distributor are designed to touch the metal segment. Ordinary transmission grease or oil, if the construction of your motor is such that oil cannot get from the transmission to the crank case, may be used. If we knew the make of your car we could tell you definitely what oil or grease to use.

1067 Usual Cause of Heating Gears.

From E. W. Hancock, New Hampshire.—I am a subscriber to your publication and would like to solicit some information about my car. I have a Maxwell Runabout, Model AB, 1911, which heats in the drive pinion bearing. I have had the repair men look the car over and so far have not been able to locate the cause. I have had a new drive shaft and a new drive pinion support and bushing, but with no results. The lubrication is all right. The bearing becomes quite hot in running a few miles. Can you suggest any obscure

cause for this heating? I have had the differential taken down but everything was apparently all right.

Reply.—The drive pinion may mesh too closely or not sufficiently so, one or both the bevel gears may not run true, bushings may be worn, or differential itself may be in poor alinement. The two usual causes for heating are insufficient lubrication and imperfect alinement.

1068

A Hopeless Proposition.

From Charles Johnston, New Jersey.—I am a reader of your paper and am very much interested in your questions and answers. I find I am up against a problem too deep for me to solve. I have a four cylinder, 4 cycle automobile engine equipped with jump spark plug ignition through battery and Splitdorf coil. I also have a Remy magneto taken from a make-and-break spark engine. I would like to use this magneto or jump spark but have had poor success so far. I connected it to the coil and ran all kinds of speeds, but there was nothing doing. What I want to know is if I can use this magneto. If so, how to connect it up, and the speed to run it. The magneto is No. 6917, type R 3 R L. I wish to hear from you on this as soon as possible and assure you that I will appreciate any suggestions from you.

Reply.—A jump spark-magneto will not operate a make-and-break ignition system, nor will a magneto designed for make-and-break operate on jump-spark for the reason that the same winding is not employed in both devices. The model Remy magneto named is apparently designed for a three-cylinder motor and is not equipped with a distributor. You are certainly up against a hopeless proposition.

1069

His Double Opposed Motor.

From Reader, New York.—I have a 1910 Demot run-about with double opposed 2 cylinder engine, automatic intake valves. Of late I have experienced difficulty with the left cylinder which fires irregularly and spark plug soots up continually. Intake valve has been reground and works perfect, also the manifold has been examined for leaks but none can be discovered. The carburetor has been adjusted in all possible positions, but none has given satisfactory results. I have found the engine mechanically in perfect condition. Valves work well, ignition is in prime condition and spark plugs also are in good order.

I find that, when trying out the car in the garage, each cylinder, tried out separately, works satisfactorily, but when both are working at the same time the engine misses occasionally. As soon as the car is taken out of the garage however, and the cold wind strikes the engine, the gas ceases to flow and the engine dies down if a load is put upon same. In connection herewith I have tested the gasoline, and though my hydrometer is not graduated below 60 degrees, the indicator, judging by the point of immersion below this figure, shows a gravity of about 55 degrees. It would seem that the cause must therefore be found in the quality of the gasoline, as in former winters the car has given very satisfactory service with gasoline of a gravity of 70 degrees or thereabouts. I give you these figures as I would greatly appreciate your opinion in regard to this matter.

Reply.—Your trouble is undoubtedly due to the heavy hard-to-vaporize gasoline of today. Owing to the long uneven length of the inlet piping some of the gasoline condenses and a richer mixture is supplied to one cylinder than to the other. Your remedy is to use 74 degrees gasoline costing probably 50 per cent. more than the automobile naphtha now obtainable. You may be

able to purchase 68 to 70 degree quality, but it is scarce and high-priced. Or you should use heat from the exhaust to assist in vaporizing; or use a separate carburetor for each cylinder and of either slightly less capacity or with a higher velocity to the fixed or constant air, and of more modern design, to vaporize the present gasoline more completely, or else replace the double-opposed motor with one of vertical type. Such troubles as you are experiencing have practically put double-opposed engines out of consideration, on account of carburetion trouble, while uneven lubrication, one cylinder getting more oil than the other, often seriously interferes with regular ignition.

1070 Another Carburetor Needed.

From Fred Poehلمان, Maryland.—I have a Moon car, 300 h. p., No. of car 950, with a Remy magneto and vibrator, four Splitdorf plugs and a Stromberg carburetor A. I have trouble with it missing, but not ordinary missing. If I let the motor run idle and open the throttle it will miss for a while, then go off on four, or if I am going along slow on high and open the throttle to get away quick, it will miss for a while, then go off on four, and then miss occasionally. I had the car to the people I bought it from. They ground the valves, put two new points on the magneto, and put one new spark plug in. They adjusted the carburetor every which way and put a smaller nozzle in the carburetor, but still the same old miss. I have fooled with my car so much that I am disgusted. Now if you can tell me what the trouble is I shall be greatly obliged. My car seems to have plenty of power when I get going. I can't get 35 to 40 miles an hour.

Reply.—There is little doubt but that you need a more modern carburetor than the Model A, old style, with which your car is equipped, due to the changes in gravity of the gasoline now on the market. It is desirable in practically every case to use heat to assist in the vaporizing process. To overcome just such troubles as beset you, the Stromberg carburetors offered now have been materially improved. The air for the constant supply past the vaporizing nozzle may be heated, the air is given a high velocity and means are also provided to draw in the gasoline to the mixing chamber in a more divided condition. Most of the cars turned out even a year or two ago will have to be equipped with more modern carburetors on account of the much harder-to-vaporize gasoline.

1071 A Chattering Noise.

From Edw. F. Miller, Pennsylvania.—I have a 1912 Regal 40 h.p. touring car that has a chattering noise when running up to ten miles per hour. When speeding to twelve miles an hour the noise disappears. I cannot hear any noise on high gear, it being plainer, however, when the car is running on the intermediate gear than when running on low gear. Noise occurs also only when ascending a grade. When going down grade there is no noise. Will you please tell me what may be the matter?

Reply.—Chattering may be caused by the clutch slipping slightly, judging from the fact that it only shows when the engine is pulling hard, ascending a grade.

1072 May Be Exhausted Cells.

From Omer North, Illinois.—What is the matter with my 1910, No. 40 Jackson automobile? It has a Splitdorf high tension magneto, with a Splitdorf non-vibrating coil. Dry cells for starting. It will be running nicely, but when it has stopped for about an hour

we cannot start it. After it has stood for about ten hours, it will start all right. The trouble is in the ignition.

Reply.—If the trouble is in the ignition it must be that the dry cells have become exhausted and after standing several hours they will have recuperated sufficiently to furnish ignition current. Your car has a Splitdorf low tension magneto, not high tension. We do not know how you proved it to be due to ignition fault. Had you given your method of locating it, probably by a course of elimination, we could probably have assisted you

1073 A Slipping Clutch.

From E. G. Watts, New Jersey.—Please advise me the best thing to do with a clutch that slips. It is one of the best leather clutches on the market and has had about a year's use.

Reply.—The cause of your clutch slipping so badly that you cannot stop it is due to probably one of two causes—imperfect alignment or inattention. By the former is meant that the crank shaft is not absolutely in line with the clutch shaft, and by the latter is meant that you allowed the clutch to slip until the leather face was ruined. The clutch adjustment should be very carefully looked to all the time, keeping the tension of the clutch spring just sufficient to prevent "hogging," but not slipping any more than is absolutely necessary. The sooner the clutch takes hold the longer the leather will last. As you have not given the name of your car we can only answer you in general. Castor oil with a small amount of neatsfoot added, is used on clutch leathers. No mineral oil, rosin or chalk should be used unless you wish to ruin the leather.

1074 Causes of Pre-ignition.

From S. Jasinsky, Iowa.—Please explain in your next issue what causes pre-ignition and how to remove it.

Reply.—Briefly stated, pre-ignition may be caused by some small particle in the cylinder being heated to incandescence, the electrodes of the spark plug becoming red-hot, or intermittent short circuit in the primary. Likewise a cylinder overheated from any cause will cause pre-ignition. The remedy is obvious.

For Ford Owners and Others.

From Henry Jurgens, Jr., Nebraska.—Recently I have noticed several articles regarding overheating of engines on too rich or too lean a mixture. I will say that I have had motors overheat on both, and I believe a lean mixture will overheat a motor just as quickly as a rich one, even though most experts will argue to the contrary. Just try cutting down on your needle valve adjustment so that the motor begins to skip when thrown on a full load, and if the motor does not overheat from this overwork, it is my treat.

If (1034) A. W. Stipek is not sure about what a Master vibrator will do for his Ford car, will say, that if he puts on one that costs him \$15 at retail, he will never regret it. Last spring I put three Master vibrators on as many different cars, and every owner is more than satisfied. In one case I had nearly given up getting the engine to run decently. I had put new timer on; saw that all wiring was good; put in new platinum contacts and springs on vibrators; put in new spark plugs, and the engine had splendid com-

pression, but I could not get it to pull worth a cent. As an experiment, I put on the Master vibrator which I had on my own car, and, say, that car fairly flew over the hills that had to be pulled on low before. Here, too, is a case where the factory does not advise the use of a Master vibrator, but no matter how good the factory's engineer may be, I think every user of the Master vibrator will say the engineers do not know it all.

In regard to filing off the dips on the bottom of the connecting rod clamp, will say that this is not necessary. Simply turn the caps around and replace, and you will have no more trouble. For starting my car in cold weather, I put a sharp shank angle priming cup on the intake manifold, just below the crotch. In very cold weather, I open this and turn the small oil can spout into priming cup filled with gasoline into the opening, and let it stand there while I crank the car, and it is a sure starter. In moderately cold weather, a slight priming through this cup is all that is necessary to start the engine. There are many little helps that one can add to his car, and yet the factory will advise to the contrary.

If (1027) E. L. S. wishes to fit his car with $3\frac{1}{2}$ -inch front wheels, he can do so by purchasing two hind wheels minus the hubs, and fit his front hub to same. If the factory does not advise the use of larger front wheels, why is it they allow Frank Kulick to use $3\frac{1}{2}$ -inch front tires on the racer?

What Guarantees are Worth.

From J. Harris Wight, Massachusetts.—I note Dr. Hadley's subject "What is a guarantee worth?" I wish to state that I had a set of one of the leading makes of tires 34x4, and one, after having been run quite a few hundred miles, gave out on the rim—what is called "rim cut." I took it to one of the tire company's agents, and he made me a very good exchange offer. I said that the tires looked to be a good set, and asked him how much he would fix the cut tire for so that he would guarantee it to hold. He said if that was satisfactory to me, he would be only too glad to fix it free of charge. He even sent it by express all charges paid. I had a friend that had several tires of this make, and some of them went bad, and they replaced them free. As they did not stand up, they got him some extra heavy ones, for which they made no charge, and these stood up fine.

I had a Stewart speedometer (you can put the name in, or not, as you see fit) and after it had run a good many miles, all at once it gave out. I sent it to the factory, and back it came, saying they had rebuilt same with their up-to-date model inside and that there would be no charges, and they hoped it would give good satisfaction, which it most decidedly did.

I have had some fights over the replacing of the parts for automobiles, but I find, as a rule, if one treats the company right, he gets things adjusted to his satisfaction, but to flare up at the company does not help matters any. As a rule, if one goes at them in a kind way, they will meet him half way. No doubt, it costs more to make these parts than a great many other things. The making may not be so much, but the handling and marketing is expensive, and if they did not make a profit, it would not pay them to bother with them. A man looks at the cost of a thing from his own point of view, and does not stop to take into consideration what it costs a factory for all its help, agents, and sales rooms, which has all to come out of the profit, and automobiles are

things which cannot be handled at a very low cost, and if there were not a profit in them, the investment would not pay interest.

Not long ago I saw a party put in four good tubes and down they went. He had one left that had been used on the rear of the car for a long time, kicking around with everything. It was a size too big, as it had stretched out. I put the tube in and the last I saw it was still on the heavy car. A tube must be put in just so, in order to get good results. A tube is made only to hold the air and not any pressure (the casing holds that) and if a tube is not true in its casing, it can never hold long.

Squeaking Springs.

From S. Jokel, Indiana.—Nearly every phase of automobiling has been discussed in Trouble Clearing House except the lubrication of squeaky and hard riding springs. I have seen new cars, out of the factory three months, with nice quiet engines and with springs making more noise than the exhaust. I don't see why manufacturers can not provide an easy way to oil the leaves of springs. They oil nearly every thing on a car and it is about time some attention is paid to that member which has more friction than any other part of car.

I have tried grease, graphite and cylinder oil, and find, while it does not last as long as the others, oil to be the best. The worst feature is in getting oil in the right place. It takes considerable time to pry leaves apart and force the oil in, which should be done, from my experience, at least, every three weeks to insure an easy riding car, and I think it repays me many times in amount of wear on the tires. Some springs have small clips and it is almost impossible to separate the leaves. If oiled, the springs respond to small bumps and the weight of the entire car and occupants is not thrown against the tires, thereby saving many stone bruises and blowouts. It is all right for the man who employs a chauffeur to have him spend two or three hours in oiling, but it is a different proposition for the owners who take care of the car. Many motors have been torn down on account of this squeaking and many dry springs broken.

Would like to hear what other readers are doing along this line and what the Editor thinks of it.

Note by the Editor.—Springs vary much, not only as to the difficulty of oiling or separating the leaves, but in riding and in the amount of friction created. The writer above must have unusual springs if they have more friction than any other part of the car or if their condition has much effect upon the wear of the tire. There is a bare possibility that manufacturers do not quite realize that under stress the leaves of springs slide upon one another in altering their shape, and of course the friction is something, but it varies in different kinds and qualities of springs. Some self-oiling device might be applied without weakening them, but the same kind of a device would hardly answer for all kinds of springs, although the more common form is the semi-elliptic in front and the $\frac{3}{4}$ elliptic in the rear. In the case of some springs it is not difficult to separate the leaves and put oil or graphite between them; nor need they be oiled as often as once in three weeks of ordinary use. To combine springs that are adapted for easy riding on both good roads and poor, with heavy loads and light, and with fast driving and slow, is not easy, and a spring of low cost is a good deal like some other things at low cost, the most expensive in the end. It would be considered a favor if some of our readers would give their experience with springs—squeaky and otherwise—with

a view of clearing up the subject of the best form and the best care.

High Price of Gasoline.

From O. H. Hampton, Indiana.—A general complaint of the high price of gasoline is now going up from all the car owners. What is the remedy? There must be a remedy, for it appears to be a fact that when any article that men use is exhausted, or what is the same thing, prices become prohibitive, it is not long until some substitute is found, and it is a reasonable hope that it will be found so in this case. The writer has been inquiring, just a little, about the comparative merits of gasoline and kerosene.

The present price of gasoline in this section is sixteen cents to dealers and auto owners. The price of kerosene to dealers is eight cents.

It is claimed that a gallon of kerosene will yield more power per gallon than gasoline. A device that will use kerosene successfully in automobile motors is greatly to be desired.

The writer is personally acquainted with a two cycle stationary motor that has been using kerosene with perfect success for more than a year, and notes several advertisements of stationary motors using kerosene, but as yet has heard of no four cycle automobile motors that are using it nor advertisements of auto motors that claim their motors are adapted to use kerosene. We hear of kerosene being used in auto motors in Europe but none in this country.

Opportunity is right now knocking at the doors of a thousand inventors in this country, many of whom will, if they take it up, find a way to make kerosene a better auto motor fuel than gasoline ever was, and it is a reasonable hope that within a year they will hand it to us.

Meanwhile it will stimulate the good work for the Automobile Dealer & Repairer to invite all who have ideas on the subject to hand them to the paper, and also for the paper to go after all possible information on the subject, and publish it for the help of those who are trying to find the way.

To Thwart the Car Thieves.

From J. A. De Armand, Iowa.—I would like to ask of the many Ford readers what if any experience they may have had with the various devices advertised as valuable aids to the easy and cheaper running of that make of auto. Especially those devices said, by the makers, to economize in gasoline and make starting easier, not to mention safety locks and so on. I had my car stolen by a couple of miscreants and I now feel that had I removed the plug they would not have got away with it. The mere fact that scoundrels will take your car with no other intent than to go as far as the gas will last and then abandon the car warrants taking enough precaution to thwart the many who know how to start a car if there is no delay to its going but do not know how to start if there is fixing to be done. As the real usefulness or uselessness of manufactured devices can only be learned by trial, like as not many of your readers know these facts and from such, light will be thankfully received.

New Spring for the Schebler Carburetor.

From Clarence L. Weimer, Pennsylvania.—In your Trouble Department, January number, I see an article headed "Motor Chokes on High Speed," No. 1039, from John C. Hirschy. Without any intention on my

part to criticize your remedy for his trouble, may I offer a suggestion for his possible relief?

The one paramount fault of the Schebler L carburetor is the tendency to produce an over rich mixture. The Schebler people will supply you with a series of springs of different tension and size for use on the auxiliary air valve. My suggestion is, try new springs until the proper spring size and tension has been ascertained. The old spring has been stretched or disfigured in some way. I had practically this same trouble with three Schebler L's in my experience and in every case a new spring did the trick. Be sure to use the knurled screw or needle valve for slow or idle running, only adjusting the intermediate speed to high speed by varying the cam spring.

Defects in Automobile Insurance.

From A. J. Abbe, Massachusetts.—Is it not time that the present method of insuring automobiles be changed for a more rational system? In the old days when a car became obsolete in a year, and in two years those who could afford cars at all were anxious to get rid of them at any price, it was well enough to rate fire insurance according to the year of manufacture and to write it "sight unseen." At present the two-year old car is by no means out of date, and the rates that are being charged for a 1911 car are wholly unjust. Is it not time to take into consideration the condition of each and every car? One man uses a car every day in his business, and in all weather, with a yearly mileage of 25,000. Another man uses his car for week-end trips in pleasant weather, with a mileage of 2,000. After two or three years of service it is not fair to rate the two cars on the same terms.

Pleased With His Clock.

From R. W. Joslyn, New Hampshire.—It is with pleasure that I write you in regard to the clock which arrived in due time, all O. K. and I am much pleased with it. It far exceeds my expectations, as one hardly expects so nice an article as that is for the same money it cost.

(Note.—The clock referred to by our correspondent is the eight day calendar clock, which can be had in either mahogany or oak finish, and will be found described in our advertising department. Any subscriber can have The Automobile Dealer and Repairer for one year and one of these clocks for \$3.90, or any one who is not a subscriber can have the advantage of this offer. It is one of the biggest clock propositions we have ever seen.—Ed.)

Likes Studded Treads.

From Hiram E. Smith, New York.—I notice in your last magazine, W. G. S., Mass., on page 63, asks if others have found good results with treads. Last spring I got four center studded treads from Niagara Falls for my Ford, Model L, car. I thought those on my front wheels made my car run hard in sand and so I took them off. But I used them on my hind wheels and liked them very much. They worked nicely on all kinds of roads. I had a tube blow out, and it did not injure my tire, or cause my car to skid, and so I feel safe in case of a blow out.

The slogan, "Will save its cost many times in a few months," which is often seen on a piece of garage equipment with or without some slight variation, is in many cases absolutely true.

SOME GOOD POINTS.

Instructive to General as Well as to Individual Readers.

From W. C. Spellberger, Maryland.—I have just taken to reading your journal and am very much interested in your trouble columns, both as a devotee to the sport of motoring, also as a means of profession, and I would like to furnish any information that I can to the troubled. In letter 1045, W. D. Fletcher, M. D., Wisconsin, I note has oiling trouble, i.e., sooty plugs and refusing to fire, due in the first place to worn rings, or worn pistons, and lastly to cylinders very much out of round. Now, if he will take the trouble he can systematically overcome these faults. No doubt, he will not need to go to the trouble of renewing rings, pistons or cylinders. Let him proceed as follows: Drop the crank case of his engine, and find out how much oil each little apartment holds before it empties at its level. If he will examine his case he will find two holes in the side that perform the office of letting surplus oil go back to the reservoir. My plan is to drill these holes $\frac{3}{8}$ of an inch, or chip them with a chisel further down toward the bottom of the case. In other words, lower the level of the oil and also lower the level in each compartment, by making the holes, in the separating walls, bigger. If he tries that and it fails, let him send his pistons to a machine shop, and have them turned in a lathe like the sketch. If that fails there is one way left. Try new rings fitted very snug at the widest part of the cylinders, and also plug up the oil pipe that runs from the sight feed on the dash and the front part of the motor, and drill and tap a place for it to enter as low as possible in the upper half of the case. I have found it to work very favorably on a few Model M Buicks. Turn a place about $\frac{1}{4}$ inch below the wrist pins and as far above as the ring will allow, to a size about 1-16 inch below the piston size, and right around the top drill at least 12 holes about 5-64 inches in diameter with a downward pitch, which make a good oil pocket and the holes act as an outlet for the oil to run back in the crank case from the inside of the piston.

I have noticed a letter, 1051, from L. J. P., Connecticut, in regard to his Overland 59. I am surprised they use Splitdorf low tension magnetos. I have worked on several makes of that car, and they have all been equipped with Remy. I have had troubles similar to his with Splitdorf magnetos, and on examination have found that instead of being de-magnetized, the trouble was due to dirty platinum points and too wide a gap between the same. After cleaning the points and adjusting the same to about 3-64 of an inch, I got elegant results from the same cars, with quite a decided pick up in speed on the spark and perfect running on a retard. Perhaps if he tries that remedy it will help him out some.

Letter 1052, from Thomas Page, North Dakota. I think if he lets the nozzles alone and uses the one he has good results from, and looks elsewhere for his ailments, such as disconnecting his gas line, and making sure his strainer is not clogged up, that is, his strainer in the double union nut from his gas line to carburetor, and sets his float at the level it was set at the factory, 15-16 inches from the bottom of the glass to the top of the float, the chances are he will get good results. Try and adjust the carburetor right and get the float set at the right place, which I think is low, which allows the motor to suck the chamber dry after it speeds up and then it dies down until it has enough in the chamber to speed up again with the same results. With all the Baby Buicks I have ever handled, we have obtained good results with a 60 needle. Perhaps his valves and cages need attention.

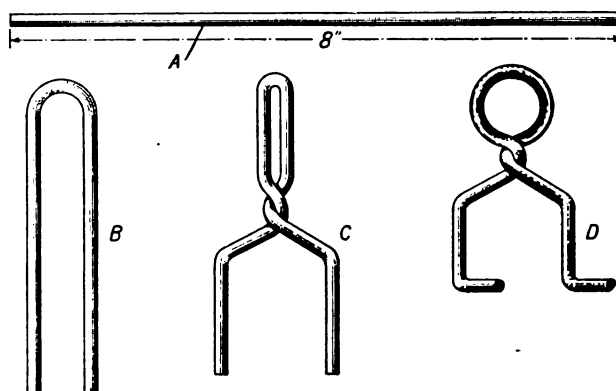
Letter from Donald A. Hampton, New York. Why all this fuss and a twelve mile unnecessary run to the shop to make a clamp when you had an almost full length axle to act as a bearing? You could have gotten a flat board and cut a hole, that is, a blind hole, somewhere near the size of the hub cap, and put the board across the wheel, tying a rope from the board in front to a radius rod or the front end of the back spring, and the back end of the board could be fastened to the back end of the rear spring with rope, which makes a very satisfactory clamp. The writer has done this many a time and some of them with the axle broken off even with the hub of the rear wheel, which makes it very pleasant for touring when you have all four wheels, instead of three wheels and a 3 x 4 x 12 foot plank to come in on.

SOME GOOD POINTS.

Carburetors, Old Casings for Shoes, Small Tire Cuts, Oils, Etc.

From Edgar C. McCall, New Jersey.—Seeing the "Air friction" carburetor mentioned lately in your paper, I would like to give my experience with it on my 1912 Ford touring car.

The car came with another carburetor which worked satisfactorily, giving around 18 miles per gallon.



For Fastening Casings.

Wishing to improve on this, I ordered an "Air friction" and put it on without having much fitting to do.

I screwed down the needle valve "home" (as I thought) and then opened it up about a half turn. The engine would do nothing but "flood," with gasoline blowing back out of the air inlet. It seemed as though there was a back pressure at times in the inlet manifold. I ground in all my valves but still the carburetor leaked gasoline after cranking the engine. Finally, I discovered that owing to a small "shoulder" on the stem of the needle valve it stuck a little when being screwed down, so that it felt like it was "home," whereas it lacked about two full turns of being shut. Naturally this caused the flooding. I operate with the needle valve open between a quarter and a half turn and on a straight run of average Jersey roads, with top and windshield up, have done 73 miles on 2 $\frac{3}{4}$ gallons, or about 26 $\frac{1}{2}$ miles per gallon. On cold mornings I open the needle valve to about $\frac{3}{4}$ of a turn and have no trouble in starting.

Regarding tire covers, I have used these made out of old tires with fair results. I find that if you use one of these covers for, say 1,000 miles, that you gain about 500 miles on the underneath tire; that is to say, it lasts 500 miles longer than it would have done without the cover. The method is as follows: Take an old casing of the same size and cut off the bead

from one side, leaving the bead on the side which looks the best. You then have a casing with a bead on one side and none on the other.

Place the casing on the floor, bead side down, and mark off six divisions with chalk. This is easy if you think of a clock and place the marks for 2, 4, 6, 8, 10 and 12 o'clock.

Then using a belt punch (about $\frac{3}{8}$ inch hole) and a small block of wood, punch two holes at each division, one inch in from the cut edge of the casing and two inches apart from each other, or one inch right and left from division mark.

Get some No. 9 galvanized iron wire and cut off six 8-inch lengths, A, in the illustration. Bend each piece in half to look like a hairpin, B. Place in a vise, loop end up, exposing about two inches. Insert a strong screwdriver or piece of round iron and twist the wire loop $\frac{3}{4}$ of a turn as shown at C, i. e., point of screwdriver describes $\frac{3}{4}$ of a circle. Catch the loop with your fingers and bend it towards you. Remove from the vise. You then have a wire loop arrangement with the two legs bent to a right angle and whose ends lie parallel with the loop D. Make six of these.

To put the old cover on top of your tire, jack up the axle, let the air out of the tire and slip the cover over the wheel, beaded side of cover to inside of wheel. You then have the cover between the wheel and the frame and it is now necessary to get it on to the tire itself.

The cut edge of the cover being next to you, proceed to work it on to the tire, pulling it towards you and using tire irons. This is the hardest part of the job but it can be managed with patience.

After the cover is on top of the tire you will find the bead of the cover about even with the rim of the wheel and this prevents the cover coming off on one side. On the "cut" side, however, it must be fastened, using the six wire loops you have made. Take one of these and insert the two legs through the holes, from inside of cover outwards.

This gives you a wire loop hanging down towards the hub of the wheel and the two legs of wire sticking out from cover. With strong pliers bend these legs downward so as to fasten the wire loop firmly in the cover.

After inserting the six wire loops, run a length of the same sized wire through all the loops, and after cutting off at the correct length and bending each end in a circle, a leather strap can be used to pull the ends up tight and thus hold the cover on firmly on the "cut" side. Then pump up your tire and you are ready to proceed.

I find that the cover prevents the small cuts in the tire which seem to start the majority of tire troubles. It is necessary to make sure that your inner tube is in good shape before putting on the cover as this outer cover makes it difficult to change tires.

Once the moisture gets to the canvas of a tire it seems to go very quickly. I find for small cuts in casings that these rubber "putties" that are sold are very good, while for cuts or punctures in inner tubes the little gasoline vulcanizers that have been brought out recently soon pay for themselves.

I have successfully mended a "blowout" about 4 inches long but had to do it in two operations, one partially overlapping the other.

I somewhat doubt the utility of shock absorbers on a light car. They seem to stiffen it up too much.

I find the anti-rattling ball socket a good thing. This is a socket backed up with a spring which goes

in underneath the engine casing to hold up the ball on the ends of the front radius rod.

I find the electric headlights driven from the magneto very efficient and convenient. I use 8 volt 10 C. P. in series.

I also like the Kingston Master vibrator coil (5 unit) which came with the car and have only had to renew my platinum points once in 7,000 miles. In this coil there is only the one adjustment to make.

I use an old gauge to show the height of oil in the crank case and would not be without it.

Speaking of oil I have been using for some time a spindle oil which costs me 13 cents per gallon, and which seems to do as well as regular automobile oil. It has, of course, a lower flash point than automobile oil, but I have not found that it forms any more carbon in the cylinders.

OXY-ACETYLENE WELDING.

Third Article Showing How to Do Difficult Work After a Little Experience.

From J. N. Bagley, Nebraska.—In our last article we referred to some of the simple jobs that should be

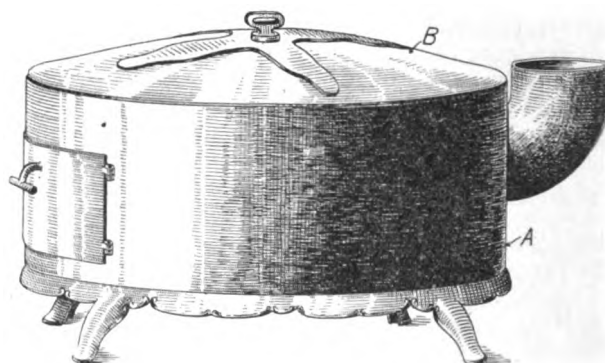


Fig. 1.

undertaken first of all, as it will be impossible to execute difficult jobs without a little experience. In preparing to make a weld sufficient time should be taken to figure out every detail of a job rather than to go after it "haphazard" and ruin it besides taking a smart slice out of your reputation as a welder. The latter will have quite a little to do with your trade, for you are likely to have plenty of old time fellows hanging about who are a little skeptical about the welding of cast iron.

Rather than turn out a job that is not perfect, or if there is a shadow of doubt, especially if the casting has any value to speak of, one had better send it to some good welder and have it done and wait for a little more experience. It is good policy to set apart a certain time to do this sort of work and not be interrupted. For every minute the gas flows through the torch it is costing you money. Some of the work can be completed in a very few minutes and if the job is charged at a fair price the unreasonable customer is liable to say he is being robbed. So it is good policy, as one will find by experience, to do this sort of work either when no one is about; or better still, have the welder in a separate room from the general repair department. In doing this work the eye must be well protected with a dark glass, therefore for the welding itself the light matters not so much, but good light is needed in the preparation. The grinding of the work before and after can be done in the machine rooms

and it matters little where the welding machine is tucked away.

The heating furnace will be taken up first in the equipment. We find two or three important points in relation to this. The size of the oven depends entirely on the size of the jobs that one expects to handle, and it is well to have the oven large enough to handle automobile engine cylinders, crank cases, housings, transmission cases, etc. Gas, especially the kind that is used with the welding machine, costs money; therefore, by heating the casting in the oven

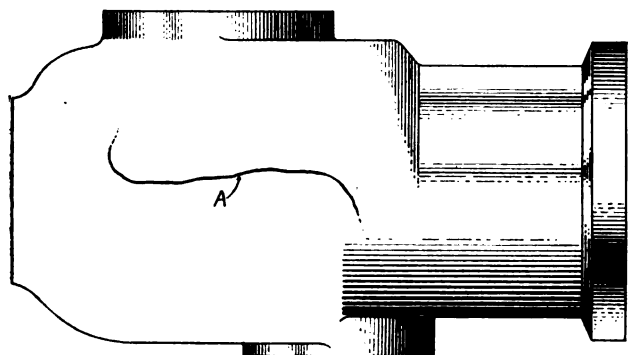


Fig. 2.

before welding you will save in a year many dollars in gas to say nothing of the time. Second, engine cylinders have a tendency to crack open after welding if they are not heated evenly before being welded. I distinctly remember the first cylinder I welded. I had been very successful with a number of small jobs and had formed the idea that what I didn't know about the welding machine was not worth knowing, but I found out differently. As fast as I welded the cylinder and lay it by to cool I heard a funny little noise, and on investigation, I found a worse crack than the one welded. This continued. Every time the cylinder cracked open it would spread the old crack and add a reasonable amount for interest on the time I was consuming. This continued until finally I got some brass rod and melted it on deep enough to permanently hold it. The job looked more like the skimmings from a ladel that had been dumped on a brick-bat than it did a welded cylinder. But one thing was in my favor; it didn't leak. Well, the owner came around and my attempt to explain matters would take too much of this valuable space, but I finally finished up by telling him I would only charge him \$2 for the day's work to say nothing about the gas I had used.

This experience put me to thinking and I found I must heat the parts that were to be welded to save gas as well as to keep them from cracking open after welding. The cylinder need not be heated more than dull red. If the crack is not too large it can be welded with safety if the metal will sizz when sprinkled with water.

The same precaution must be used in cooling the cylinder as in heating before welding. In Fig. 1 is shown a suitable arrangement for the business. It is made in the shape of a wood burner stove about two and one-half feet long and twenty inches wide. The entire top B, can be removed, thus leaving the opening the size of the body A. In this sort of a heating device it is possible to heat a cylinder for welding in a very short time, and as soon as welded it can be placed back in the oven and left for the fire to die out and the cylinder to cool. Or if a number of jobs are on hand and the oven cannot be used for a cooling

device, a very good plan is to have a lime box to place the cylinders in after welding. This may be made of sheet iron, wood or cement. As soon as the cylinder is welded it can be placed in the box and covered with air slacked lime. This lime will hold the heat from three to five hours, depending somewhat on the size of the cylinder welded.

Welding a Cylinder.

In the broken water jacket as shown at Fig. 3, A represents the crack in the jacket. The first thing to do is to remove all brass fittings, valves, etc., as the heat from the oven will injure them. Next in order is the grinding to get the cylinder in shape before placing in the fire. This is done by grinding out the V notch treated in the last article. This notch should be about halfway through the jacket or near enough so that the melted metal will unite the remaining metal and make a solid weld. Welding the cylinder after it has been heated takes but a minute or so, as the heat from the tip soon melts the metal if the work has before been well warmed. The small welding rod should be warm enough so that the flux will stick to it and run in the V, until it is filled a little above the surface, thus giving plenty of metal to be ground away leaving the weld as smooth as the original surface. One should aim to grind the V notch an inch farther than the crack, for many times the crack will show up a little farther after it is heated than before. It only takes a few seconds longer and many times saves the trouble of heating the cylinder up the second time. Always paint the cylinder up in nice shape before turning it out. It adds much and the customer feels he has his money's worth if the job looks well.

In Fig. 3 we have a cracked head from a stationary engine. These are not hard to weld except they re-

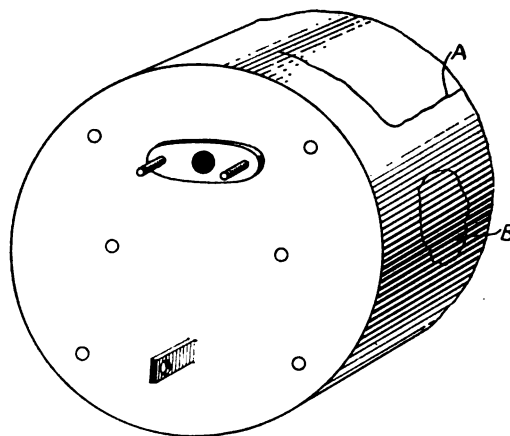


Fig. 3.

quire time and attention. In the first place all valves, rocker arms, igniter, etc., should be removed. Next in order place the crack over a narrow emery wheel and grind the V notch the entire length of the crack A. For this purpose a wheel of about 6 inches by $\frac{3}{8}$ inch is a very good wheel, but it should not be speeded too fast. One should have some form of a flexible grinder that the work may be ground while hot or the heavy work may be left on the bench and ground. The writer is now working on a flexible shaft grinder that, if it proves a success, any one with a reasonable amount of mechanical ability and a few tools can make one.

Referring again to Fig. 3, there is one important point which we have overlooked. Generally when

they crack in the shape shown in the drawing, and this is usually the case, the piece will rise up from a quarter to a half inch, and if this is forced down by a hammer the chances are that it would break out entirely. I have found a very good plan for this job is to place a heavy clamp over it and force it to its place. Of course, if the clamp is taken off, it will at once return to its natural shape, but if the clamp is left on until it is heated well along this particular side it will take its place and stay while being welded.

When finishing up the head for painting one should be very careful that the face is still true where it bolts to the cylinder as the least raise or irregular surface will give no end of trouble. In case there is a hole broken out and the piece entirely misplaced, it is up to the operator to build it in as best he can. Something of the kind shown at B, Fig. 3, often comes to the shop. The first thing to do in this case is to build up under the missing piece with moulding sand or a suitable clay, working it down until it holds the same shape as the balance of the work. This should be a trifle farther below the surface of the work than the jacket is thick. Now by taking the torch and welding rods it is possible to run this full of melted rods and knit it together along the edges, and when it is ground and finished an expert cannot detect it.

Almost any round piece of cylinder construction,

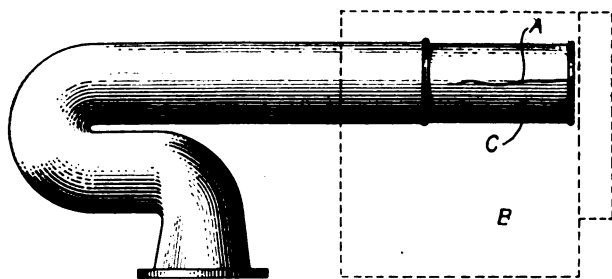


Fig. 4.

if made of cast iron, will crack open in cooling if not before heated, and some of them the instant the heat strikes them. All of this class of work should be cooled slow, either in air-slacked lime or in a bed of fine wood ashes. I have found the wood ashes fine, and if the furnace can be used for a cooling oven so much the better for the job can be welded and placed again in the furnace and left to cool as the fire dies out. This does not take any great length of time, especially if the fuel used is wood or corn cobs.

In Fig. 4 is shown a sewer trap—a flush trap—I think it was called. Three of these came to me shortly after I had started my welder. They were broken, as shown at A. C was about 8 inches across. This was about the first job of this sort that I had ever tried. I had lots of fun before I finished it. The first one I welded I just set up as shown with the crack up and welded it and it held. Why this did not crack open I am not able to tell, but it didn't, and I began to think it was an easy matter to do the welding stunt, but as I tried the next one I began to have trouble and couldn't understand it when the first one worked so well. Well, I welded the second one and had hung up the torch only a few minutes when my attention was attracted by a crack. The crack was larger than before and a little longer. Finally, I was a little out of humor and placed the bell of the trap between the two walls of a building and closed the crack with a jack screw. This did the job, but I would not advise the use of jack screws.

At the third attempt, after wiping off the perspira-

tion and getting the kinks out of my back I dragged the trap (it weighed 300 pounds) into the room and began to study the thing. I finally decided to heat it out in the back yard and see if I could save the annoying crack from the last attempt. To make a long story short, I filled the inside of it with sand to keep the heat from passing back from the bell and covered it over with a large piece of tin, B. With wood and cobs I heated the bell hot and welded it. As soon as it was welded I left it to cool until the temperature had dropped to normal over the welded place. This one was a fine job and I didn't need the jack screw, either.

RETREADING TIRES.

Why Extreme Care is Necessary to Produce the Best Results.

The retreading of tires, although undoubtedly economical if properly carried out, has sometimes led to trouble, with the result that some users of motor cars have come to the conclusion that retreading is a somewhat doubtful expedient. Undoubtedly cases have occurred where failure has happened in ordinary retreading and it is well to reason out the matter. Providing that the rubber of the tread is of good quality and substantial thickness the only form of failure of the tire is bursting, and as this depends entirely on the canvas casing of the tire the action upon it may be considered.

First of all the tire may be cut by sharp stones. Wet then gets through these places and to the canvas casing, eventually rotting it, with the result that the tire may then burst at this spot. In 99 cases out of 100 no steps are taken to stop the holes and so prevent the wet from getting through. Failure from this cause may happen as quickly with new tires as with retreaded ones. In any case when the rubber of the tread has become worn, it will in all probability become perforated to some degree and the outer layers of canvas of the casing will be somewhat impaired in strength. There is, however, another trouble which should be mentioned. Supposing the cover be run deflated: In the sketches shown in the illustration, the action on two points A B on the outside and inside layers of canvas is as follows: When properly inflated the points are opposite one another, but on deflation a drift occurs between the two which can only be arrived at by the layers sliding one upon the other, and this action is only met by the elasticity of the rubber holding the layers together.

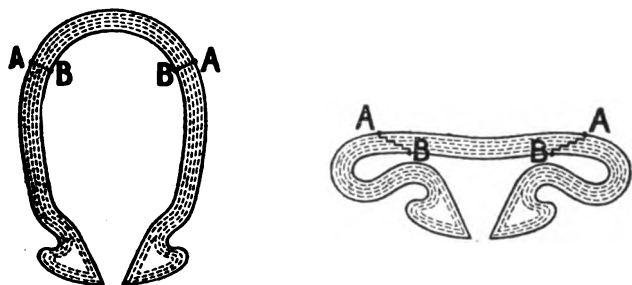
In a less degree this occurs even when the tire is fairly well inflated and ultimately the layers of canvas part company. If the tire is continuously run in this condition the layers will rub one upon the other, wearing out portions of every layer which forms the casing. Moreover, the drive of the back wheels is always transmitted from the metal rim of the wheel to the rubber tread of the tire by the canvas walls of the tire. Each canvas layer should do its share of the work and the work is transmitted to the next outside it, and from the outside layer to the rubber tread by the adhesion of these parts to one another. If, however, any of these parts break away an additional strain is put on those places where the layers still hold to one another, resulting in time to a cumulative action leading to disintegration.

In the ordinary retreading process the old tread is first cleaned off, the casing is then solutioned, and a new tread rubber compound is placed upon it. The tire is then wrapped up and placed in a steam pan where it becomes vulcanized. Nothing is done to remove the

defects in the casing, which nearly always exist in a greater or less degree, and nothing is done to make up the diminished strength of the casing. No special means are taken to ensure the new treading adhering firmly to the casing and the wet steam with which the cover comes into contact in the vulcanizing process therefore tends to weaken the casing.

The method of tire reconstruction adopted by Messrs. Ripley, Strong & Co., of Farnborough, England, overcomes these difficulties. First of all the tire is carefully examined and then the old treading adhering firmly to the canvas casing thoroughly cleaned. The casing is then placed in a chamber through which dry air is passed in order to remove any moisture continuing in the casing. After some little time the casing is taken out and reconstructed, perished canvas is removed, new canvas layers are added, and the whole is united by a special and patented process in a uniform body in which every layer of canvas is firmly united to its neighbor, each taking its proper share of the total strain. The whole casing is saturated throughout its thickness with new rubber injected at very great pressure, giving it a further extended period of usefulness. In this way the foundation of the tire is thoroughly reconstructed, and is in contrast to the usual method of simply placing a protective covering of rubber over a neglected casing.

After this is done the tread is fixed upon the casing



Showing the pressure against the tire.

and it is important that this should adhere absolutely just as well as that the layers of the casing should adhere to one another. The elasticity of the rubber would otherwise tend to drag it free of the casing, and if this occurred, wear would take place both on the inside of the rubber and on the top of the casing, even faster than the wear of the tread upon the road. Unless special precautions are taken, adherence is, however, very slight under ordinary conditions and among the necessary precautions is the use of a special quality of rubber of very high adhesive properties for attaching the tread. Special molds are used, ensuring a high and uniform pressure during the process. These molds prevent the steam from coming into contact with and injuring the casing and at the same time restore the proper shape to the cover which has become deformed. The molds also put a similar pressure inside the tire to that with which it will meet under actual road conditions. Hence the rubber of the tread is under compression and when the cover is fully inflated it is not stretched as is usually the case. Hence its resistance to cuts is increased and if it does become cut, these cuts will not gape open as would otherwise happen.

If the soundness of the casing and the adherence of the tread can be ensured by the methods above described good rubber on the tread can be used to advantage and will then show its full benefit, and after the casing has been reconstructed treads of any of the usual patterns of good quality are fitted. It will be seen therefore that extreme care is taken in the fundamental

portions of the process in order to render a long life to the reconstructed article, and it therefore appears that this firm has worked upon very sound lines.

The New Cord Tire.

In toughness of tread and adhesion of the different parts to one another, the "fabric cord tire" marks quite a departure from the ordinary tire. There are many distinctive features that will recommend it to the automobile user, and its unusual strength is secured from a peculiar construction of its fabric, which produces durability, comparative immunity from stone-bruising and rim-cutting, less danger of under-inflating, unusual resiliency and easy riding. One of the features of the tire is its extraordinary resiliency. Heat developed in a tire means degradation of rubber and constant perishing of the tire. In perfecting the tire, the company, which is manufacturing the new tire, has produced a novelty. It is claimed that a car equipped with the tire will show a much better performance on the road than with the ordinary tire.

Each unit cord is made up of a number of fine cotton threads about the size of sewing cotton. This thread is selected with great care and to insure its uniformity a number of samples from each case are tested. Unless these samples meet rigid specifications the whole case is rejected.

The company claims that a car equipped with Diamond Silvertown Cord tires will travel 25 per cent. farther per gallon of gasoline, and a saving of 15 per cent. in the horsepower of the car is effected. This enables the car to get under way quicker and climb hills not possible when other tires are used.

If your dealer does not carry these tires in stock, they may be readily obtained at any of the fifty-four Diamond service stations.

Use of Kerosene.

It is largely a matter for trial whether any particular carburetor will enable kerosene to be used. The general experience is that a specially-designed carburetor must be used to obtain proper vaporization of the kerosene and, therefore, complete combustion. Some gasoline carburetors, if mounted close to the engine and kept at a comparatively high temperature, will give some measure of success with kerosene, but not full power or a smokeless exhaust as with gasoline. There is, however, no reason why the experiment should not be tried; there can be no ill effects. The worst that can happen is the sooting up of the spark plugs and valves owing to incomplete combustion.

This May Help Mr. Ellis.

From F. H. M., Rhode Island.—Tell Mr. Ellis, No. 1037, that I had an Atwater-Kent system that went dead as his does, off and on, after three years, when I got onto the fact that wiggling the switch would start it up. I took off the switch lever and bent it so that it pressed harder against the box. It has not troubled since. He might try it. My answer to his question No. 3, is "No."

(Note.—The question referred to—No. 3—was whether one of the later styles of the Atwater-Kent system would be more efficient than the 1808 style.—Ed.)

The best mechanic is the cheapest at a high price. The unskilled workman usually does harm.

Automobile Dealer and Repairer

A Magazine of condensed and compact information for busy readers.

PUBLISHED THE MIDDLE OF EACH MONTH BY
THE MOTOR VEHICLE PUBLISHING CO.
 71-73 Murray Street, New York

Telephone, 6765 Barclay Post Office Box, 654
 Entered as second-class matter at the Post Office in New York City.

M. T. RICHARDSON, President and Treasurer.
 A. A. HILL, Editor.
 F. R. WHITTEN, Secretary and Advertising Manager.

TERMS OF SUBSCRIPTION.

One Copy, One Year, Including Postage.....\$1.00
 One Copy, Six Months.....60 cents
 Single Number.....10 cents
 Foreign Subscriptions.....\$1.50, or 6s. 3d.
 Remittances should be made by Express Money Order, Draft, Post Office Order, or Registered Letter. Foreign remittances, where possible, by International Money Order.

ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, FEBRUARY, 1913.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

CAUTION.

Our readers are cautioned not to pay money for subscriptions to J. Henry Graham. He is no longer a representative of this paper.

A QUESTION OF JUSTICE AND DUTY.

A correspondent from St. Louis, Mo., who gives us no street address, and thus prevents us from answering his letter by mail, and who signs himself "Willie Wiseman," accused the editor of being "afraid to knock" tire protectors because "some of these people advertise in your journal." Willie may be a Wiseman, but he is not a courageous and manly one, else he would have not given an assumed name.

But let that pass. Possibly other readers here and there do not quite understand that the editor of this journal has nothing to do with the advertising, and those who have to do with the advertising have nothing to do with the editing.

The aim of the editor is to be absolutely just with those who advertise and with those who do not. Now let us briefly define absolute justice as it applies to advertisers and to non-advertisers. The fact that one individual, or a score, for that matter, condemn a certain thing is not evidence—much less proof—that it is defective; it is merely testimony that it may be so, and testimony is often unreliable.

For illustration, we have recently received complaints concerning the way guarantees are carried out as well as concerning the value of tire protectors. But in this issue we publish an article from Mr. Wight of Massachusetts, showing that in some cases guarantees have been more than made good, and from another reader showing that tire protectors are of decided value. It will thus be seen that were we to print letters attacking accessories or other things, we might not only be doing

a grave injustice, but be plainly culpable under our somewhat rigorous libel laws.

Some years ago, the writer took a trip to Alaska. He carried with him a so-called "Primus Stove." When he had climbed the Chilkoot and descended on the other side, beyond the reach of civilization, he undertook to light his kerosene stove but was unable to do so. It appeared that he had lost the slip of directions, or had never had one. At all events, it would not work, and simply because the writer did not understand it. At about that time "your deponent" would have been glad to send a communication to some periodical decrying the stove in his most censorious vocabulary. But after he had given up trying to use it, and had purchased at "Yukon prices," just a plain every-day wood stove, a "tenderfoot" came along, told him how to light and use it, and from that time on it was invaluable. The defect was in the purchaser and not in the stove.

Now to be just a bit more explicit as between advertisers and non-advertisers, while we do not intend to do an injustice to either, for under all the canons of duty, both profane and sacred, we are always justified in bestowing praise, but we are not always justified in publicly uttering censure. The scriptural injunction is, "Go tell him his fault between thee and him alone," it is not, go and tell his fault to some one else, much less to tell it to a multitude of others. So when a reader knows of a fault, why not write the manufacturer—"between thee and him alone?"

So much for the negative—for the censure, the complaint. How about the favor? Well, although we have no right and no intention of doing either advertisers or non-advertisers an injury, we have a reason and a right, when it comes to a favor, to do one to an advertiser when we would not do one to a non-advertiser.

The clergyman spends far more effort trying to save the souls of his parishioners than of those who do not go to his church, although others are just as much in need of it and he would be delighted to feel sure of their salvation. The doctor tries to cure his own patients, and although he does not cast stones at others who are ill, he does not go out of his way to prescribe for them. The lawyer moves heaven and earth to secure justice for his client—and some say he will even go farther than this in the case of a guilty one—but though others who may be caught in the meshes of trouble may have his sympathy, and he would under no consideration wish them ill, yet he gives the benefit of his legal knowledge and the force of his logic to only those who come to him as clients and perhaps have handed over the retainer.

We have gone into this matter a little further than at first intended, but it is hoped it may somewhat clear up the measure of responsibility the publisher bears to his advertisers as well as to the rest of the wide world.

BETTER THAN LOW-PRICED GASOLINE.

This is not the occasion for discussing the necessity or the lack of necessity for the recent rise in the price of gasoline. That subject is encompassed in the well worn law of supply and demand and of the question of trusts and monopoly, things that have been ably discussed for years by the brightest minds of this or of any other country.

But there is one phase of the question of the high cost of running automobiles that has never received a tithe of the attention it deserves. Suppose every road or street were absolutely smooth upon which automobiles are run, how would this affect the consumption and consequently the price of gasoline?

Although the question is not of course susceptible

of absolute proof, it is safe to say that it would reduce the consumption of gasoline at least one-half.

Let us see how this statement may be substantiated. In the first place, the necessity for so much weight and strength in an automobile is due to the shocks it must undergo and not to the load it carries. In making their tests automobile manufacturers select the worst roads they can find. They well know that a car of a given weight and strength may run for years on a smooth surface where there is no shock, when it will fail the instant it undergoes the shock and the strain of a poor road. For not only must the weight and strength of a car be much greater to undergo road shocks and hard pulling, but it is safe to say it must be twice as heavy and strong as for the smooth surface that a railroad train, for instance, runs on.

Now we are not prepared to say that a car of half the weight when run on smooth surfaces requires but half the amount of fuel and lubricating oil that is required under present conditions and weight, but it will approximate this reduced amount. But even a reduction of one-third of the consumption of gasoline would bring the price down to about what it was until a recent rise. We have known of a lessened consumption of one-third in a given commodity to bring down the price to less than one-half the former price. Nothing so affects price as even a modicum of surplus or deficiency.

But smooth highways act as a still further reduction in the cost of automobile up-keep. A car of one-half the present weight and of one-half the present strength would not only consume much less fuel; it could be sold for much less price, and this would be an original purchase advantage.

And smooth highways would do still more. They would obviate the necessity for shock absorbers, as they relate to both springs and to other devices. With no shocks nothing is needed to absorb shocks.

Finally, in our opinion, smooth highways would obviate the necessity for pneumatic tires. Please note the "opinion" reservation. Although we have, of course, never had the opportunity of making a test, we believe a solid tire of a given weight will run easier on a perfectly smooth surface than a pneumatic tire, and this statement is made with a full apprehension of the undoubted advantage of pneumatic tires on rough surfaces. But it would be easy enough to test this, and the test should be made. Let a car with pneumatic tires be driven over a given distance of smooth concrete track at a given speed. Then let the same car be supplied with cushion tires of the same weight as the pneumatic tires, and be driven over the same distance at the same speed, and note the exact consumption of fuel. In our opinion, there will be less fuel used in the last trip than in the first.

It is of course admitted that in the construction of automobiles a margin of safety must be allowed for the bad road no matter how short it may be or how infrequently the car may be driven over it, but why have the bad road at such a tremendous cost? Why not have it eliminated entirely from automobile highways? We believe this could be accomplished with much less effort than by attacking the great law of supply and demand which in the case of gasoline is controlled by the fundamental law of nature, together with a trust that has been so regulated by the government that it is not supposed to secure an "unreasonable restraint of trade."

Meantime, the car owner must at present suffer both from the high price of gasoline and from poor highways. There is no immediate prospect for a substitute for gasoline, however much it may be needed. The necessity for this substitute is far greater in Europe than in

the United States, but thus far search and experiment have not met with success there. Possibly the electric vehicle may soon be developed to a successful substitute, or, as a more remote possibility, the steam car which will use kerosene instead of gasoline as a fuel to get up steam.

But the remedy of the greatest economy and public utility although impossible to secure immediately, would be smooth highways which would entirely eliminate shocks.

"BLAZING THE TRAIL."

Some twelve or fourteen years ago LeRoy Pelletier, who is now such an active figure in the automobile world, was in Dawson, Alaska, selling mining lots, and at that time he gave evidence of the qualities that make for successful business. He knew what he wanted to say and to do; he was frank and courteous; he thought and acted quickly; he was a natural pioneer; he was aggressive and he was not afraid of hard work. His rise to prominence in the business world is largely due to these characteristics of mind and heart, and the sole object of making these observations is to point a moral to other young men who are striving to get ahead. Although if they possess and practice these qualities, they may not gain the success that he has, and indeed, may not gain any success whatever, "for 'tis not in the power of mortals to command success," yet they will do as much, or as Cato said once upon a time, "do more, Sempronius—we'll deserve it."

We understand that Mr. Pelletier has been elected secretary of Splitdorf's new electrical starter company. But his activities will not be confined to this alone, as he is to be likewise interested in other non-competing enterprises in the automobile business. He is said to have been unusually successful in handling big national advertising campaigns, and in nothing else is the aggressive and active qualities he possesses so essential to that success.

One of the great—possibly the greatest—essentials to business success is the pioneer spirit: either doing an entirely new thing or doing an old thing a new way. Both are of a pioneer character, and no one makes a success in business unless one or the other form of "blazing the trail" is practiced.

61,000,000 POUNDS OF FREE MAIL.

Postmaster General Hitchcock in his report states that during the fiscal year, 1912, 300,000,000 pieces of mail, having an aggregate weight of about 61,000,000 pounds, were carried free through the mails under the franks of congressmen and of the various government establishments, and that if postage at the ordinary rates had been paid on this matter, the revenues of the department would have been increased by more than \$20,000,000. And yet the post office department for nearly four years has been attempting to raise the postage on second class publications, and thereby increase largely the cost of the reading matter of the people, because manifestly if the publishers are compelled to pay a largely increased rate of postage they must obtain an increased subscription rate.

Both the Postmaster General and the President have been fond of calling the low second class rate now prevailing a "subsidy" to the publishers. It is well known that the publishers long ago gave away to the public all the advantage they got out of a low rate of postage. In point of fact, if there is any subsidy about it, it is a subsidy to the public, and the public is entitled to it and should not be deprived of it under any pretense.

WIRE WHEEL TESTS.

Before the comparative merits of wood, wire and all steel wheels can be finally decided, it will be necessary to make other tests than simply to find the strength of each. It has been claimed that wire wheels save pneumatic tires. Why not put on rear wood wheel on a car, and one rear wire wheel, and see which tire lasts longest. Then make another test with the all steel wheel, by the way, that is more or less popular in France.

But this test would not be conclusive in all respects. It would pay to put on a set of wire wheels and drive a car say, 100 miles; then put on the wood wheels and drive the car the same distance and over the same road to see which set of wheels use the most fuel. Few have any idea of the increase in fuel consumption when heavy wheels are used as compared with light ones.

The difficulty of procuring satisfactory wood spokes and rims is becoming more and more acute especially in Europe. In our opinion, wire wheels are not only superior to wood wheels in all respects save in the single instance of requiring more care to keep them clean, but the time is soon coming when they will become of general use.

Under this consideration, their merits and demerits should be known for a certainty.

WORM GEAR EFFICIENCY.

It has probably been noted by some of our readers that we have intimated our belief that worm gears were not as efficient as bevel gears, and that chain transmission is more efficient than either, although in other respects the bevel gear has advantages.

But we also have no opinion we do not willingly exchange for a contrary fact. It appears that an English firm has been making some interesting tests of worm gears and that it is claimed to be of high efficiency at all speeds and loads. At a speed of 12 miles an hour only, the transmission efficiency was up as high as 95 per cent. and as the speed rises, the efficiency maintains itself at above 96 per cent. This is rather surprising, but we are glad to thus state the facts as this firm—the Daimler Co.—give them.

The highest claim of efficiency before made is that when properly designed, the worm gear will transmit 85 to 90 per cent. of the engine power to the rear wheels on direct drive.

But be this power efficiency more or less, it will be generally conceded that the worm gear is not only the most silent in operation of all forms of power transmissions, but that if properly designed, its efficiency becomes more rather than less as the gearing wears.

NOT A LUXURY.

"The automobile is a luxury. Any person who is able to own one should not object to the small cost of the fuel that is used, as it is very small in comparison with the upkeep of the machine."—D. A. Cunningham, president of the Becket-Eiseman Oil and Gas Co., of Indiana in the New York Herald.

The foregoing is astounding, coming as it does from a 20th century business man. Where under the sun can Mr. Cunningham have kept himself during the past five or six years? He must have been asleep. The automobile passed out of the luxury class long ago, and it is now as much of a necessity to the man that has use for a vehicle of travel and transportation as the horse ever was. Nor is the cost of gasoline "very small in comparison to the upkeep of the machine." The principal items of cost of the upkeep of the automobile of today are the tire expense, the fuel (gasoline) expense, and the

lubricating expense, in the order named. Beyond these, the upkeep expense is small.

LESSONS FOR DRIVERS.**Carelessness and Ignorance Responsible for Most Accidents.**

The accidents reported this month from all over the country are as numerous, and the details of many of them are quite as sickening as usual. Many of them due to skidding on the icy roads or streets, something that might be expected in cold weather.

It should be borne in mind that all automobile accidents are due to fast driving. It is true that in some cases accidents have occurred when the car was being driven slowly, but the accident would not have occurred if the car had been driven still more slowly. For illustration, we hear of some child being run over in the street. The newspaper account states that "the car was being driven slowly, and the accident was unavoidable, the child having ran directly in front of the car." But if the car had been driven slow enough it could have been stopped even though the child had run directly in front of it. Of course children should not be allowed to thus run into danger, but they are allowed to do so, and knowing the condition, a driver should take it into account. This is not to maintain that the child or the child's parents, were not to blame. But as long as this magazine is not being published for children or for the inculcation of parental discipline, we have nothing to do with that side of the case. It is our duty to try to make careful automobile drivers, and to show that dangerous speed is more largely relative than usually considered. There are occasions when speed is imperative—duty demands it—just as in the case of an ambulance call or a response to a fire, or a call to a physician, but it is not in such instances that this warning should be applied. It is rather for the ordinary driver, and so long as he is willing to put the "eating up" of time, so to speak, against the safety of other users of the highways—so long as he imagines he can use the public highways the same way that a locomotive driver uses private highways, and well graded highways, and tracks that absolutely prevent side slipping—so long will there be accidents and plenty of them.

Lack of space and the necessity of avoiding too much repetition leads us to not give much in the way of specific cases, this month. This magazine could be literally filled with the skeletons of avoidable—and easily avoidable—accidents this month.

Crashed Into a Street Car.—Seven persons were injured, two of them seriously, in St. Louis, when a big touring automobile crashed into the side of an electric street car. There were five men in the car when it struck and it was going 40 miles an hour. The street car had about a dozen passengers, and, beside the four who were hurt and taken to the hospital, all were badly shaken up. When the auto hit the car it in some manner became entangled with it and was dragged north for half a block. The street car was thrown from the track, and, according to the police, an axle was broken.

Instantly Killed.—An automobile in Central Park, New York, smashed against the curbing, overturned, killed the chauffeur, and seriously injured four passengers. It was simply a case of careless driving.

A Child Terribly Injured.—A child of six years was struck by an automobile in Allentown, Pa., and so

mangled and maimed that her life is despaired of. She was running to meet her father and as she left the sidewalk the mud guard struck her a glancing blow, knocking her down with the force of a battering ram.

Plunged Over a Bridge.—Near Fresno, Cal., in attempting to avoid a motorcyclist a car was driven off a bridge. A woman was thrown on her head and instantly killed, her husband had both legs broken, and two other passengers may be crippled for life.

A Skidding Car.—Near Philadelphia a car skidded beyond control, shot over an embankment and killed a well-known society man and athlete. He was crushed under the car but a companion escaped.

Cars Smash Each Other.—Two cars crashed together in Nashville, Tenn., and were demolished although the passengers escaped. The local papers say "the accident was unavoidable." Possibly; but the cause was that both turned out the same time to pass a wagon.

SOME LOW-PRICED POWER WAGONS.

Success of the Automobile Delivery Car is Now an Assured Fact.

The displacement of horse-drawn for horseless vehicles for delivery and other business purposes is now greater than ever before and it is increasing by leaps and bounds. In fact there are today quite as many manufacturers of commercial cars and trucks as pleasure cars, and having adopted the motor truck method of transporting goods, owners of cars are now concentrating their effort upon the placing of the new system on the most profitable basis.

The big point in operating one truck or a fleet is to arrange the system so that the vehicle may be kept constantly at work. If a large or a small investment stands idle for any great length of time, the profits are all eaten up in fixed charges.

If, however, the power wagon is kept on the move the greater part of the working day, the gain over horse-drawn methods is little short of extraordinary. In the last twelve months truck owners and manufacturers of commercial cars alike have been exercising the greatest ingenuity in their efforts to "speed up" the handling of commodities. Methods of loading and unloading have been improved to a remarkable extent. One wholesale grocery house in Los Angeles increased the efficiency of its eleven motor trucks over 30 per cent. by the use of warehouse pickup trucks, designed so that two make a complete motor truck load. These small trucks are loaded on the warehouse floors, sent down the elevator to the loading platform and there await the return of a motor truck, when they are immediately wheeled into place two on each chassis, and start on their way to the customer without delay.

Another installation illustrating the possibilities of time-saving in loading is that of a lumber company in a Middle Western city. Only one truck is used, but by the use of yard pick-up wagons and a special loading platform, the possible daily mileage of the truck has been increased to a point where it is only accomplished by equipping the yard pick-up wagons and the loading platform with sets of steel rollers, similar to those forming the bed of the motor truck. During the day the pick-up wagons go about the lumber yard to the different lumber piles. On these wagons loads are made up, ready to be delivered around the city and suburbs. The entire load is then transferred from rollers on the pick-up wagons to the

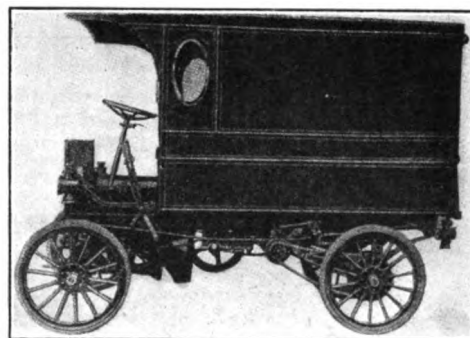
rollers on the platform, where it remains as a unit until the motor truck is ready to take it on.

Many of the smaller companies and men which have purchased motor trucks have used great ingenuity in contriving to use their machines the largest possible proportion of the time and so get the maximum dividends out of them. It is common to employ them night and day, and on Sunday to fit them with special passenger bodies and to use them as sight-seeing cars. One company of Fall River, Mass., with two trucks, has succeeded in expanding its business greatly. When horses were employed this firm's business consisted mainly of hauling household goods from place to place in Fall River. Now, short shipments that were formerly made by railroad are made by truck, the machine sometimes carrying its burden a hundred miles or more. In the season the trucks are employed all night carrying strawberries and vegetables to Providence, thirty miles away. On Sundays in summer the trucks carry excursionists to the beaches.

We give herewith specifications of some of the lower priced gasoline commercial cars, and these will be followed from month to month with others—both low and high priced. It does not follow that because a car is low-priced it is the best and cheapest to buy and to use, but in many instances these low-priced cars are extremely effective, and the amount of money invested in any business is an important consideration, especially when the natural deterioration is considered, as in the case of either horse-drawn or horseless vehicles.

Hatfield Auto Truck.

Prices: J, chassis, \$850; K, \$1,200.
Load Capacity: 1,000 and 2,000 pounds.
Cylinders: Three 2-cycle valveless, cast separately, $4\frac{1}{8} \times 4$ inches.
Cooling: Air.
Ignition: Single system, with Bosch high tension magneto, and dynamo on J.



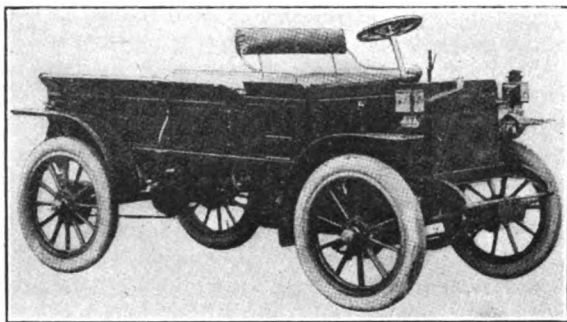
Hatfield, 18-h.p. model, made by the Auto Truck Co., Elmira, N. Y.

Tires: Front, $34 \times 2\frac{1}{2}$ and 34×3 inches; rear, 34×3 and $34 \times 3\frac{1}{2}$ inches.
Wheel Base: 88 and 96 inches.
Chassis Weight: 1,700 and 1,800 pounds.
Type of Springs: Front, semi-elliptic; rear, semi-elliptic.
Brakes: Service on jackshaft; emergency on rear wheels.
Transmission: Friction drive.
Speed: Ten forward and one reversed.
Final Drive: Chain friction.
Control Arrangement: Operator sits on left with brake and gear levers on left.

Wolverine-Detroit.

Prices and Bodies: Chassis, \$800; open express body, \$850; panel body, \$900.
Load Capacity: One-half ton.
Cylinders: One, cast separately, $4\frac{1}{2} \times 5\frac{1}{2}$ inches.

Valve Arrangement: On same side, L-head.
 Cooling: Water, with thermo-syphon circulation and vertical tube radiator.
 Carburetor: Holley.
 Ignition: Single system, with Witherbee magneto and multiple battery and dry cells.
 Tires: Front, 32 x 4 inches; rear, 32 x 4 inches.
 Wheel Base: 96 inches.
 Chassis Weight: 1,550 pounds.
 Type of Springs: Semi-elliptic, front and rear.

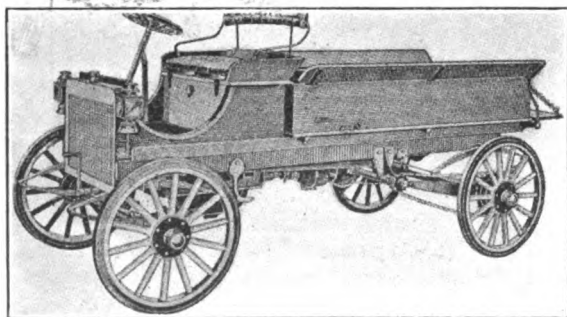


Model C, 12 h.p., made by Pratt, Carter, Sigsbee Co., Detroit, Mich.

Brakes: External contracting on rear hubs.
 Transmission: Friction drive.
 Speeds: Any number forward and one reverse with direct drive on any speed.
 Final Drive: Shaft and bevel gear.
 Control Arrangement: Operator sits on left with brake and gear levers on left.
 Equipment: Three oil lamps, horn, pump, jack, tool kit, tire repair kit, Q-D rims, demountable rims \$20.00 extra, magneto \$30.00.

Available Truck.

Prices and Bodies: Chassis, \$800; open express, \$875; grocer's top, \$925; full panel, \$1,000.
 Load Capacity: $\frac{3}{4}$ ton.
 Cylinders: Two opposed, cast separately, 5 $\frac{1}{4}$ x 4 inches, L-head.
 Cooling: Water, with thermo-syphon circulation and honeycomb radiator.
 Carburetor: Schebler.
 Ignition: Dual system, with Briggs magneto and dry cells.



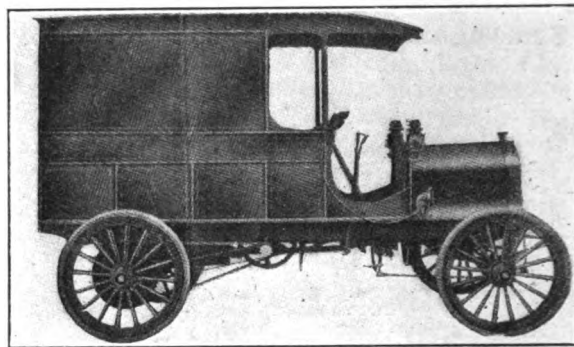
Model 15, 22 h.p., made by the Available Truck Co., Chicago, Ill

Tires: Front, 34 x 2 inches; rear, 34 x 2 inches.
 Wheel Base: 100 inches.
 Chassis Weight: 1,900 pounds.
 Type of Springs: Front, full elliptic; rear, full elliptic.
 Brakes: Service and emergency on rear wheels.
 Clutch: Multiple disc.
 Change Gear: Planetary type.
 Speeds: Two forward and one reverse with direct drive on second speed.

Final Drive: Two chains.
 Control Arrangement: Operator sits on right with brake and gear levers on right.
 Equipment: Three oil lamps, horn and tools.

Kearns Motor Car.

Prices and Bodies: A, panel express, \$1,150; B, open express \$1,075.
 Load Capacity: 1,500 pounds.
 Cylinders: Two, 4 $\frac{1}{2}$ x 5 inches; 2-cycle, valveless,



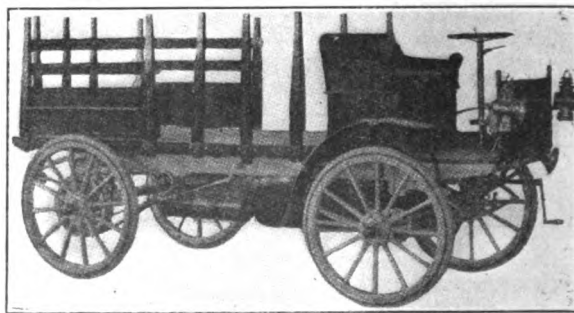
20 h.p. Kearns, made by the Kearns Motor Co., Beaverstown, Pa.

water cooled, or 3 cylinders, 4 x 4 inches, air cooled, 2-cycle.
 Carburetor: Schebler.
 Ignition: Atwater-Kent unisparker single system, with dry cells.
 Tires: Front 34 x 2 inches; rear 34 x 2 inches.
 Wheel base: 100 inches.
 Type of Springs: Front, full elliptic; rear, full elliptic.
 Brakes: Band on each rear wheel, emergency by reverse on disc.

Transmission: Friction drive.
 Speeds: Ten forward and two reverse.
 Final Drive: Double chain.
 Control Arrangement: Operator sits on right with brake and gear levers on right.
 Equipment: Three oil lamps, horn and tool kit.

Veerac Motor Car.

Prices and Bodies: Chassis, \$1,100; express, \$1,150; stake, \$1,175; enclosed, \$1,250.
 Load Capacity: 2,000 pounds.
 Cylinders: Two, cast separately, 4 x 4 inches.



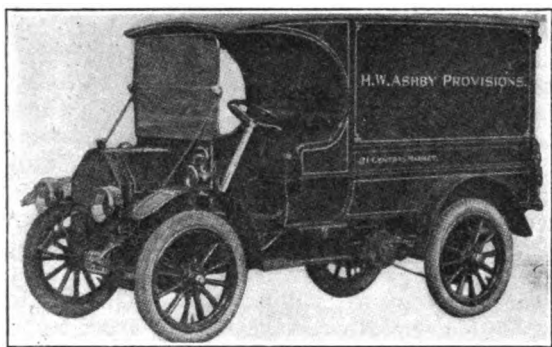
22 h. p. model, made by the Veerac Motor Co., Ankona, Minn.

Cooling: Air.
 Carburetor: Krice.
 Ignition: Single Atwater Kent dual system, with low tension magneto and dry cells.
 Tires: Front, 36 x 2 $\frac{1}{2}$ inches; rear, 36 x 3 inches.
 Wheel Base: 86 inches.
 Chassis Weight: 1,850 pounds.
 Type of Springs: Front, $\frac{3}{4}$ elliptic; rear, full elliptic.
 Brakes: Expanding on rear wheels.
 Clutch: Multiple disc.

Change Gear: Planetary.
 Speeds: Two forward and one reverse with direct drive on high speed.
 Final Drive: Two chains.
 Control Arrangement: Operator sits on left with brake and gear levers on left.
 Equipment: Three oil lamps, horn and tools.

Gabriel Car.

Price and Body: Open express, \$900.
 Load Capacity: 1,000 pounds.
 Cylinders: Two, cast separately (opposed), 5 x 4 inches, with valves in heads.
 Cooling: Water, with thermo-syphon circulation and honeycomb radiator.
 Carburetor: Stromberg.
 Ignition: Single system, with Bosch magneto.
 Tires: Front, 34 x 4 inches; rear, 34 x 4 inches.
 Wheel Base: 96 inches.
 Chassis Weight: 1,800 pounds.
 Type of Springs: Front, semi-elliptic; rear, semi-elliptic.



Model G, 22 h.p., made by the Gabriel Auto Co., Cleveland, O.

Brakes: External contracting on jackshaft; internal expanding on rear wheels.
 Transmission: Planetary type.
 Speeds: Two forward and one reverse with direct drive on second speed.
 Final Drive: Double chain.
 Control Arrangement: Operator sits on left with brake and gear levers in center.
 Equipment: Top over seat, windshield, speedometer, tools, tool box, jack, pump, oil side lamps, oil tail lamp, horn.

HIS EXPERIENCE.

Result of Using a Ford Car in the Livery Service and on Hard Roads.

From F. R. Marrs, North Dakota.—At this time I hope it will not come amiss if I recall some of the personal experiences I have had in two seasons' use of the Ford car in the livery service.

I have had several years' experience in the repair and painting of gasoline engines, autos and such things, but when I bought my first car in March, 1911, I had never had hold of the steering wheel, and knew nothing whatever about running a car. I went right at it all alone, and before I had driven two miles, was nearly in the ditch more times than I can now remember. However, I had in past years plenty of practice in riding bicycles, and this stood me pretty well in for the driving part. I soon mastered the steering part, and had little trouble along this line. I drove this old 1910 car about 8,000 miles and sold it in October of the same year for nearly what I had paid for it. I then bought another one nearly like it, only

in much poorer shape, for considerable less money than I got for the first one. I ran this car about 1,600 miles that fall and then took it into the shop for repairs. I went all through it and replaced every part that showed the least wear; put on a new top, and fore doors, repainted, and spent all told something like \$135 on it. In the spring of 1912, I started with this car looking like a new one, and used it every day I had anything to do. On the 8th day of October, I sold this car for more than I paid for it. Then I bought a new one that had never been run a mile.

Now, I had driven these two cars a total of more than 17,000 miles, some of it over the worst kind of roads, in fact many many miles of it no road whatever; many times with a big overload. For instance, one circus day, having too many for one trip and not enough for two, I took eight persons (with myself and I weigh over 200) 24 miles over some of the most hilly roads we have here, many of them that very few cars ever climb in high gear, and but once did I have to change gear. I had many times to run up to 35 miles per hour at the bottom to get to the top in high, and with this load that weighed more than the car itself.

I made it all right and no trouble. Many people stared at the number of passengers that were being carried at an average speed of more than 20 miles per hour.

I have never laid up nor refused to go on account of any kind of roads, and we have all kinds here. I started after a fishing party in the Turtle mountains when it had been raining for two days, and many people told me I would never get there. I made it all alone, came back with a big load, and made the entire trip of 90 miles without mishap of any nature, although I had to run mile after mile in low, and burned up nearly 10 gallons of gasoline for the trip.

I never saw the roads so bad that I would not go if some one wanted me to, and was willing to pay for the trip. I have had to make some pretty close calls for trains, but have never yet started to make a train where I failed. Have had several very close calls. I charge for these trips that have to be made in a hurry, but if I fail to get there, the trip costs nothing. I have not lost out yet.

Break down? Yes, I have had some that stopped me right there; two rear axles, two rear hubs, one differential spider. This makes just five times that I have been laid up in all this time. Once I broke down in backing out from my garage, once not two blocks from the same place, and three times I had to be towed home. But in all this breaking, I have been lucky. In every case it has been after I delivered my "fare" and was all alone, with one exception; this was when I had a large party of "joy riders," who wanted to show off and start in high, and did not get away from the starting place more than ten feet.

On October 8, 1912, I bought a new Ford touring car, and I have driven this machine 3,078 miles, and have never had a tool of any kind on it except to replace tires. Have not had a spark plug out of the cylinder, have never had the motor top off, have never touched the coils, have never had to do anything with it. It has the Holly carburetor, and the Kingston coils, and I let these strictly alone as long as they are all right. I have been running all winter so far, and we have had lots of snow. On the 28th of October we had a big snow that drifted badly, and on the day after or the 29th, I made a trip out to the country 9 miles that took us just two hours and ten

minutes. We were not moving all the time, but when we were not, we were trying to move. We went through soft wet snow (the worst there is) that came up to the top of the wheels, and had to get out time after time and tramp down the snow to crank up. We had to shovel and dig out. I have been through snow drifts in the last week that were three feet deep, and forced through by backing out and hitting them time and again until we made it.

I have driven as much as 6 miles at a time in low gear with no possible chance of getting into high, and turned right around and came back through it.

Now, in all this driving, I have averaged a little less than 23 miles to the gallon of gasoline, and that, too, when many, many times for an entire trip I could not get more than ten miles to the gallon.

I have paid for the new car I have now, and have a little more than \$300 left for profit, after paying for every cent of repairs, both materials and labor. Beside this, I have driven possibly more than 2,000 miles that I could get no credit for, as it was pleasure and business for myself. I only gave these cars credit for the cash actually taken in, but I charged them for every cent of expense, of whatever nature.

HOW TO SAVE GASOLINE.

Now That the Price is High Attention is Being Directed to Waste.

The manager of one of the well-known great automobile manufacturing corporations says: "I have recently noted several articles, quoting automobile manufacturers and others as deprecating the recent increases in the price of gasoline. Some have even professed to see in the advance a menace to automobile popularity and industry. As a matter of fact, the difference amounts to but a fraction of a cent for each mile per car, and should not, in a season's running of 5,000 miles, exceed a total of \$25.

"Before the internal-combustion motor, gasoline was virtually a by-product, on sale at central stations for perhaps 10 cents a gallon. The cost of delivery fell on the buyer and often amounted to more than this figure. The oil companies were glad to sell the gasoline at almost any price, for this enabled them to manufacture at a profit, greater quantities of oils, greases and lubricants. While this condition prevailed, the buyers of the staples paid a large share of the motorist's fuel bill.

"But gasoline motor cars multiplied, and eventually the demand for fuel equaled that for the other products. A year or so ago, the old balance was reversed. Now the demand for gasoline greatly exceeds that for the staple oils and greases. And, in place of the old method of distribution, the oil companies have established a system which covers the entire country, bringing to the very door of each garage a refined product which has often traveled thousands of miles. When one considers the cost of drilling, pumping, transportation, refining and delivering, he must admit that there is no manufactured product sold as cheaply as gasoline. Even at its present price it costs the consumer less than an equal quantity of most brands of spring water.

"When the demand for gasoline came to exceed that for the other crude oil products, the manufacturers faced a dilemma. They could not produce gasoline and throw away the other products; such a process would have made the fuel prohibitive in cost. To advance the price of gasoline and to lower the

price of the other products was the only available means of regaining the balance. So now we pay more for gasoline and less for oils and greases.

"As a matter of fact, we have all wasted gasoline; it has been so cheap. A little economy will hurt none of us.

"Automobile manufacturers have built wasteful cars—cars with motors much larger than necessity demanded; cars that lacked efficiency. But the manufacturer is seeing the light. The recent New York show emphasized a new tendency—a tendency toward motors that yield more in miles per gallon. But these cars will fail to save gasoline unless their owners do their part.

"Just as a wasteful car raises the cost of gasoline, so every motorist who fails to make his car efficient, makes fuel cost more. Owners of automobiles owe it to each other to start a united effort, keeping track of gallon-miles, watching carburetion, learning the art of controlling a car more by the clutch and less by the brakes. A campaign along this line will save enough gasoline to more than balance the recent increase in cost.

"Our office files contain hundreds of letters from tourists whose cars have averaged from 15 to 25 miles per gallon on ordinary country roads and a car should yield at least ten miles a gallon in city traffic where there are many more starts and stops. If motorists generally would regard these averages as standards, and would strive to exceed them, the condition would be immediately relieved.

"The cost of gasoline will advance no further than the necessities of the oil companies' production require. The necessities are, to a large degree, in the hands of motorists themselves."

THE BOSTON AUTOMOBILE SHOW.

The annual Automobile Show at Boston will be as usual an event of great importance. Some consider this the most important of all the national shows, coming as it does just on the threshold of the buying season when car owners purchase their supplies.

The Boston show will consist of two divisions or parts, the first part being devoted to pleasure vehicles and the second part being a comprehensive exhibit of trucks and other commercial vehicles. Pleasure cars will be shown from March 8th to March 15th, inclusive, in the great Mechanics Building, which is one of the largest exhibition halls in America.

The commercial car show will be held March 19th to March 26th, in the same building.

There has been an unprecedented demand for space in both shows, and great success is already assured.

These Boston shows have the official sanction of the Automobile Board of Trade. They will be held under the auspices of the Boston Automobile Dealers' Association, and Chester I. Campbell, as in past years, will be the efficient manager.

The management always devises some especially beautiful decorative scheme, reserving the details as a secret, until the actual opening of the Show.

This magazine will be represented at the Show during the Pleasure Vehicle exhibition, in Space 357, Sect. D., Basement, the space to be in charge of F. R. Whitten, with Miss Edna Noonan as assistant.

Experience has taught me not to wait for parts to wear out entirely. When they have become worn, or have given as much service as I can logically expect, then they are to be replaced.

CAR WASHING.

More Information Concerning Work That Should Be Done With Care.

In washing a car use plenty of water. Of course it is preferable to wash a car immediately it comes in from a run, that is to say, when the mud, if there be any on it, is still wet. In such a case the panels and wings should be flushed with water from a hose, if the latter be available, but the force of the water issuing from the hose should be a minimum. Some washers seem to think it is correct to use a very high pressure of water in the hose and let it issue directly upon the panels. The effect of this is to cause the minute portions of grit found in the mud to scratch the varnish. The stream of water should not be aimed directly upon the panels in this way, but almost parallel to them at a low pressure, so that the water in falling merely by gravity should carry with it the loose particles of grit. The finest particles are not, however, removed without the aid of a sponge, but when possible the sponge should be operated with one hand while a constant stream of water from the hose at low pressure is directed so as to run down the panel from a point above the sponge, the hose being held in the other hand. If a hose be not available a soft sponge and a pail of water must, of course, be used, but even in this case do not be sparing with water.

In commencing to wash a car body with a sponge and a pail of water the sponge should be dipped into the pail so as to pick up as much water as it will hold and squeezed out at the top of the panels so that the water can, as in the case of the use of a hose, merely trickle down the panels to carry with it the loose dirt.

If the car has been put away unwashed, and the mud be dry before washing operations are commenced, it is bad policy to attempt to remove the mud immediately. It should be thoroughly soaked first with plenty of water, and twenty minutes to half an hour is not too much time to give the water to soak into the dirt before an attempt is made to remove it. Of course, it is not always convenient to allow this length of time to elapse, but usually the period can be utilized by proceeding with some other operation of the cleaning, such as polishing the lamps. When the dirt has become thoroughly soaked the course recommended above should be followed. That is to say, plenty of water should be used either with a sponge or from a hose, and the mud floated off rather than wiped off. It must be borne in mind that even with a sponge full of water, if this be drawn over a dirty panel a scouring effect is produced. The grit will cut into the varnish just as much whether it be wet or dry, so that in removing it every endeavor should be made to allow merely the flow of the water to carry the dirt away.

In dealing with the underside of the mudguards there is not the necessity, of course, for this care, for in this part there is usually no varnish to spoil. When every trace of grit has been removed from the panels by the method suggested, the sponge is no longer required but a large chamois leather, which has previously been rinsed again and again in clear water. After wringing this wet leather so as to make it as dry as possible, it should be shaken and the panels very carefully wiped over to remove the surplus water. This operation may be gone over two or three times, and the best effect will be obtained when, after wiping over the panels and wringing out the leather in

a pail of clean water, no discoloration of the water occurs.

A well varnished panel should require no polishing other than that naturally given by the wet chamois leather. It is only poor varnish and scratched panels which require the use of specially prepared polishes.

A cleaning brush should only be used on such parts as wheels, axles, running boards, and the underneath of the wings. That is to say, those parts where there is no high finish, and where usually the mud is thrown up so violently that the force of the grit itself scores the varnish. In dealing with these parts a brush may be used. The old-fashioned carriage brush serve some purposes, but when comparatively inaccessible parts are required to be dealt with a brush with an extension handle is preferable. As with panel washing, so in the case of the parts where a brush is used plenty of water should be applied, and a soaking period allowed if time can be spared.

In dealing with wheels and the other parts where the brush is used there is no objection to the water being directed upon the dirty parts at high pressure, for this frequently aids in removing the lumps of mud which frequently occur. After the use of the hose and brush, the sponge with plenty of water may be requisitioned, this being followed as in the case of the panels by the removal of the surplus water with a leather. This leather, however, should be kept distinct from the leather used for panels, for unless very great care be taken it will usually be found that the leather used for wings and wheels has picked up particles of grit.

In washing the car and using the hose with a high pressure of water, care should be taken that the stream of water is not aimed directly at such parts as brakes, wheel bearings, radiator, etc., for high pressure may drive the water inside the wheel bearings, where the water of its own accord might not soak in.

It has been previously recommended that a car should, if possible, be washed immediately it comes in from a run. If, however, it should be inconvenient to wash the whole car a point should be made of washing the bonnet, for the heat of the engine and the rain together have sometimes a permanently bad effect upon the bonnet varnish, causing stains to appear that can never be removed. To remove grease from the varnish, use soapy soft water with a sponge. This is better than kerosene. But if you prefer kerosene, do not use a sponge to apply it but a piece of soft rag.

A Word for Tire Protectors and Guarantees.

From Eliot Gorton, New Jersey.—As a subscriber I am always interested in looking over your "trouble" department and often get good suggestions. Lately, there has been quite a little pro and con—chiefly con—in regard to tire protectors. Possibly a wail in the other direction may be of interest. I have used Woodworth Treads for three winters, putting them on rear tires in November and removing them in March. I have used 32x3½, 36x4 and 37x5, and have always put them over new tires. When I have removed them in March or April my tires have been as good as new without a scratch almost, so, I think very favorably of them and think those users who have had trouble have not kept tires properly inflated. The latter is most important for good service. On the other hand, there is no question but that they use more power. They detract materially from a tire's resiliency and use fully 15 per cent. more power, but

to offset this you have tire protection from mud and ice and nothing cuts a tire quicker than ice. As to guarantee, I had one protector (37x5), go to the bad and upon returning it to the Woodworth Company they not only replaced it with a new one but thanked me for allowing them the privilege. One could not ask for more. And so it goes.

Big Price for a Gasoline Substitute.

The International Association of Recognized Automobile Clubs proposes to offer a prize of \$100,000 for the production of a fuel which will be a substitute for gasoline. The conditions proposed are that the fuel must be obtainable in large quantities, and must be of such a nature as to preclude the possibility of its being monopolized by a trust; that it must be free of taxation, and of such a nature to make its admission into foreign countries possible at a very low fixed tax. Complete regulations have not yet been drawn up. The International Association includes all of the large motoring bodies of Europe, as well as the Automobile Club of America, and the American Automobile Association.

What Caused the Knock.

From A. W. K., England.—Some few weeks ago I was troubled by a most mysterious knocking in my car which for a long time absolutely defied detection. The noise, which could only be described as "appalling," would commence quite suddenly, last perhaps for half an hour, or it might be half a day, and then as suddenly cease. Quite in despair of finding out the cause, I left town one afternoon, the car traveling perfectly and the knock being conspicuous only by its absence. Before I was two miles on the road, however, the noise suddenly started, and I at once returned to the garage I had just left and took on board the foreman of the works, so that he might hear the knocking for himself. It did not need a journey of more than three hundred yards to satisfy him that the car should not be run in that condition, though he was quite unable to suggest what the trouble might be. We returned, therefore, to the garage, took the car into the works, and having jacked up the back wheels and removed the floorboards and gear box cover, started up the engine and awaited develop-

ments. We had not long to wait, for immediately the knocking recommenced so loudly that quite a number of men at work in the shop put down their tools and came crowding round to see the fun. At this point the noise was at its worst, as if the engine had really made up its mind to show what knocking was, and the noise was deafening. The solution of the mystery, however, was soon forthcoming. Down on the ground went my friend the foreman, who emerged a minute later from underneath the car with the discovery that the driving pulley of the electric lighting dynamo was loose on the shaft and had worked up alongside the back of the brake against the bolts, on the ends of which it was coming into violent contact. This was the explanation of the whole affair, the reason of the occasional cessation of the noise being that every now and then the pulley would be jerked back into its proper position, where it would be temporarily fixed on to the shaft until an extra jolt on the road would once again send it up against the brake. An hour's work next morning, the pulley was once again a fixture, and the knocking is no more.

For Steam Car Information.

From L. O. Frantz, Ohio.—If you will tell Mr. William J. F. Runkle, Pennsylvania, to write me a description of his car, and enclose postage, I will try to help him out. Any one else that wishes any information concerning White steamers that will write to me, I will be glad to do what I can to help them out of their troubles.

Why Not?

In place of the usual handle, why not have a wheel somewhat like the steering wheel, as then both hands could be used? It need not be large. In case of a premature fire, the wheel would simply slip through the fingers, and no serious harm be done.

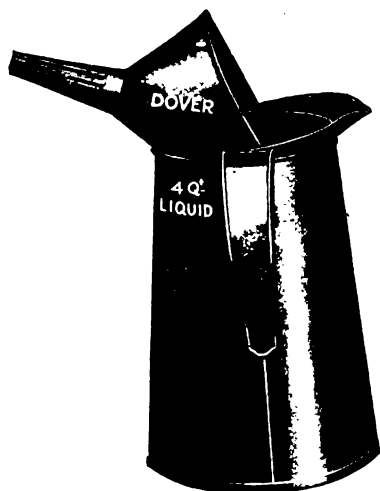
If the tires are to remain on the wheels for a considerable length of time while the car is out of service the wheels should be jacked up and only about five pounds of air left in each tire. This keeps the tubes in shape and also preserves their softness and pliability.

A FREE AUTOMOBILE AND ACCESSORY SHOW.

The automobile show in the pages that follow in this issue can be seen as you sit by your own fireside, with no "high lights" or fanfare of music. Look it over carefully; inspect the new things at your leisure, and if you see anything you want or want anything you don't see, write to the manufacturer, dealer, or to the publisher of this magazine, according to your needs. The advertising pages of an up-to-date magazine should be an "index rerum" and a "vade mecum" to all business men.

Two Useful Dover Specialties.

We illustrate two new Dover specialties which should interest every car owner and supply dealer. The Dover Duplex Combination Measure and Funnel is extremely convenient. Note in the illustration the pouring lip with center channel—a new feature. This makes a regular fast-pouring measure for pouring into large openings. The



Dover Duplex Combination Measure and Funnel.

funnel on opposite side of pouring lip is filling oilers or pouring into small openings. The spout of the funnel points slightly upward so that when the measure is set down all oil runs back into the measure, instead of dripping outside. The handle is on the side, which is not only a convenience and a refinement, but a necessity in filling oil reservoirs in close quarters or cramped places.

We also illustrate the Dover "Saval" Shut Off Funnel. This funnel has a movable hoop for holding the chamois, a fine brass strainer, side handle for convenience and an automatic, indestructible ball valve shut off. Simply



Dover "Saval" Shut-Off Funnel.

lift the funnel from the filling hole in the tank or can and no more gasoline can run through the spout, and the funnel can be lifted from the tank at any time, to see how much gasoline is in the tank without waiting for the funnel to empty itself. Ask your dealer for these goods, or write for prices and information, or write direct to the Dover Stamping Manufacturing Company and mention this publication.

Important to Dealers.—The Prest-O-Lite Company, 251 East South street, Indianapolis, Ind., has a full page announcement in this issue especially ad-

dressed to dealers with respect to the lighting problem. This company has prepared a booklet entitled "Insist on Gas Lighting" which it will send to any dealer who will cut the coupon out of their advertisement on another page, fill in his name and address and forward it to them. The Prest-O-Lite is a simple, efficient automatic lighter for gas lamps that every dealer ought to be acquainted with.

The Goodnow Gasoline Gallon Gauge.

One of the most useful specialties for automobile owners which has been recently brought to our notice is the gallon gasoline gauge here illustrated. This is for measuring the amount of gasoline in supply tanks. The numbered markers are slideable and may be adjusted to show the number of gallons in any given tank whether it is square, round, oval or irregular in shape. The depth of each gallon is the same in a square sided tank. In round or oval tanks the depth of the gallons will be less towards the middle of the tank. The outside level marker shown is to register the amount in tank at any given time. With this gauge the autoist may note the amount of gasoline used on any particu-



The Goodnow Gasoline Gallon Gauge.

lar run, thereby ascertaining the mileage per gallon.

The owner of a motor boat can ascertain the amount of gasoline consumed in going from place to place, and will therefore know the amount required on a given trip or between supply points.

This gauge is handsomely finished in black stained wood, 15 inches long, with 20 brass markers. If your tank holds more than 20 gallons, extra markers will be inserted as ordered.

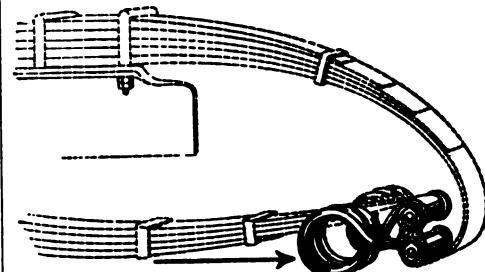
This extremely useful article will be mailed postpaid to any address in the United States, for only 50 cents. Send express or postoffice money order, or stamps will be accepted. Extra long gauges, made to order for very deep tanks, not more than 24 inches in length, numbered from one to thirty as may be required, price 75 cents, postpaid. Ask your dealer, or send orders direct to the Goodnow Mfg. Company, 753 Old South Building, Boston, Mass.

Annular Ball Bearings.—If our readers will send their worn out Annular Ball Bearings to the Ahlberg Bearing Co. at one of the various addresses given in their advertisement on another page, they will be re-ground and made as good as new. They also make a

complete stock of S. R. B. Annular and Thrust and New Departure Double Row and Radax Bearings. Write at once for their prices mentioning The Automobile Dealer and Repairer.

Acme Torsion Springs.

One of the hardest obstacles for the manufacture of autos to overcome has been the vibration. This purpose is admirably fulfilled by the Acme Torsion Springs, as shown in the cut. The Acme are legion in their work, they overcome



The Acme Torsion Spring.

all excess duty from the tires, placing it upon the springs where it belongs, leaving only tread duty for which the tires were designed. This feature in itself is of such importance that the saving in the wear and tear of the tires will offset the cost of the springs within a few weeks. Not only does the Acme Torsion springs insure against the wear of the tires, but also, engine trouble, upkeep expense, the life of the car, and in addition affords delightful and comfortable riding, as the car runs along easily and quietly without a tremor or jar even over the roughest road.

Acme Springs cost at least one-third less than shock absorbers, yet the manufacturers claim they are even more effective. All the Taxicabs in Boston have been equipped with these springs, including the Armstrong Transfer Company, Taxi Service Company and Taxi Motor Car Company, and these contracts were given out in competition with every known device on the market. Interested readers should write for prices to the Acme Torsion Spring Company, 1000 Boylston street, Boston, Mass., and mention this magazine.

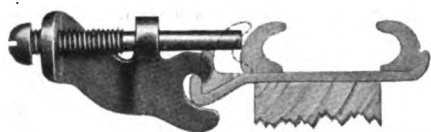
This company has added to its line a new special attachment for Ford cars, which is meeting with great success. Inquiries from Ford owners are solicited.

The Haight Auto Lighter.—This light is controlled from the seat and is easy to light. You simply turn the hand wheel and the trick is done. The price has recently been reduced to such a point as to put the light within the means of almost every car owner. Agents and dealers are requested to write for a special liberal proposition to the Haight Auto Lighter Co., Lansing, Mich. Car owners should write for circulars and full particulars.

Graphite.—The Joseph Dixon Crucible Company has just brought out a new catalogue describing Graphite and its uses, which they would like to send to every reader who may be interested. This catalog comprises 100 pages and will be sent free of charge to any reader who may write for it. See the advertisement of this company on another page. Automobile owners everywhere should familiarize themselves with the Dixon Graphite Lubricants.

Tobey's Live Auto Specialties.

Automobile owners who use demountable rims should all be interested in the Q. D. Rim Remover, illustrated herewith. This tool is used by hooking it over the edge of tire rim, on fixed or demountable rims, between the ends of the locking ring on Universal, Firestone, Goodyear or Booth Quick Detachable Rims. It will, by turning the screw, when tire is deflated and the clamp nut removed from valve tube, and tube is forced up into rim so that the plate on top of valve tube clears inside of casing, force the clincher ring or bead ring from the position in dotted lines over the locking ring to the position shown, so that the locking ring can be easily removed. If the ends of the locking ring are too close to admit the hook of the tool, deflate the tire and the ends can be pried apart by the end of a screw driver to admit the hook and remove the ring. When the ring is out, file or saw the free end of the ring so there will be space for the tool in future removals. When replacing the tire,



The Q. D. Rim Remover.

the inner tube can be inflated enough to be sure it is not nipping anywhere and then forced on the wheel. This tool does away with the annoyance and delay usually experienced when trying to uncover the locking ring with screw driver, chisel, and the usual tools found in the tool kit, and will safely apply a pressure of 250 lbs. to the rim. It saves time, labor and trouble. Nickel plated and case hardened it weighs but 2½ ounces.

This tool is manufactured by Wm. L. Tobey of East Boston, Mass.

Mr. Tobey has just brought out a new auto specialty which is equally useful, and which he calls a "Head Light Glare



Removing Glare of Approaching Head Light.

Remover," which we also illustrate. This consists of an amber colored glass of suitable diameter to protect the eyes and gives the maximum unshaded view of the road. This glass is carried by a nickle-plated and polished brass tube attaching to the edge of the windshield, giving the lightest and strongest attachment. The tube is secured by nickle-plated, polished, spring steel clamps to any type of edge, round, square or plain glass, in any required position. It can be attached to the middle bar when top shield is down, or to the top bar when top shield is up. It can be left in place at all times or is easily detached and stowed away.

By moving the head so that the approaching headlights are seen through the amber colored glass, the blinding glare is removed, the view of the road

and the approaching car is unobstructed, and the danger to passengers and the public is avoided. At all times, there is a clear vision ahead. This device can be attached to any windshield, having round tube, square frame, or plain glass edge. It is adjustable, for height and position to suit any driver.

If not carried by your dealer, mailed



Clear Vision Ahead.

in the United States. Prepaid on receipt of \$2.50. Address all correspondence to Wm. L. Tobey, 12 Lewis street, East Boston, Mass., and mention this magazine.

The Kraemer Releaser & Retainer.

This valuable tool will be found illustrated and briefly described in our advertising columns. It is made by the United States Compass Company of Cedarburg, Wis., and is for sale by jobbers throughout the country. If your dealer does not keep it write direct to the manufacturers, as above. Dealers are invited to write for a special discount.

Genuine Dunlop Straight Side Tires.

The special attention of all dealers is called to the Genuine Dunlop Straight Side Tires manufactured by the U. S. Tire Company of New York. One point in favor of this tire is that it cannot rim cut. The manufacturers are particularly proud of this product and they describe it as the premier automobile tire of the world. It may be interesting to know that the sales of these Dunlop tires have increased 600 per cent. within the past year. Every dealer who carries this tire in stock, and car owners should also investigate. All correspondence should be addressed to the United States Tire Company, New York City, or to any of their numerous branches throughout the United States. In writing, mention this magazine.

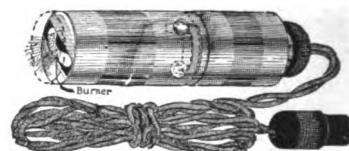
How to Prevent Slipping or Squeaking Brakes.

Slipping brakes are the result of the brake lining becoming oil-soaked, water-soaked or worn. In such condition they jeopardize the machine and the lives of its occupants as well as the lives of others. A little wafer may now be had, about the size of a silver quarter, one of which it is said will stop such brakes from slipping or squeaking; lasting for a long time. A little water revives its action until its effect is entirely consumed, when another wafer is then used. These little Rex Anti-Slip Brake Wafers need no recommendation; for they are a product of the Armiger Chemical Company of Chicago, Ill., the well-known manufacturers of Rex Metal Polish, Rex Wood Oil, Rex Leather Dressing and Rex Nickel Polish. The price of the wafers is twenty-five cents the box of twenty-five wafers, prepaid by parcel post where unobtainable from local dealer.

Subscribe to the "Automobile Dealer and Repairer," \$1.00 Per Year.

The Morse Electric Cigar Lighter.

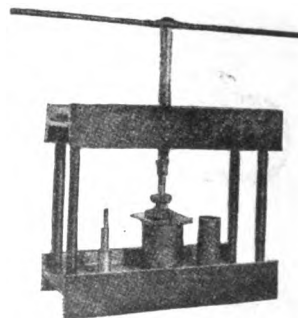
This is a novelty in an electric lighter, so constructed that it can be plugged into the same receptacle generally used for a trouble-lamp, and a cigar can be instantly lighted with the car in motion. This device is so small that it can be carried in a vest pocket. Every man who drives a car realizes how hard it is to get a light with a match with the car moving. This lighter is reasonable in price and should be owned by every man who drives a car. It is manufactured by Frank W. Morse, Boston, Mass., who is one of the largest if not the largest, manufacturer of electric



lighting appliances for automobiles, in this country. If your dealer does not carry this electric cigar lighter in stock, write direct to Frank W. Morse, Atlantic avenue, Boston, Mass., and mention this magazine.

Post's Arbor and Gear Press.

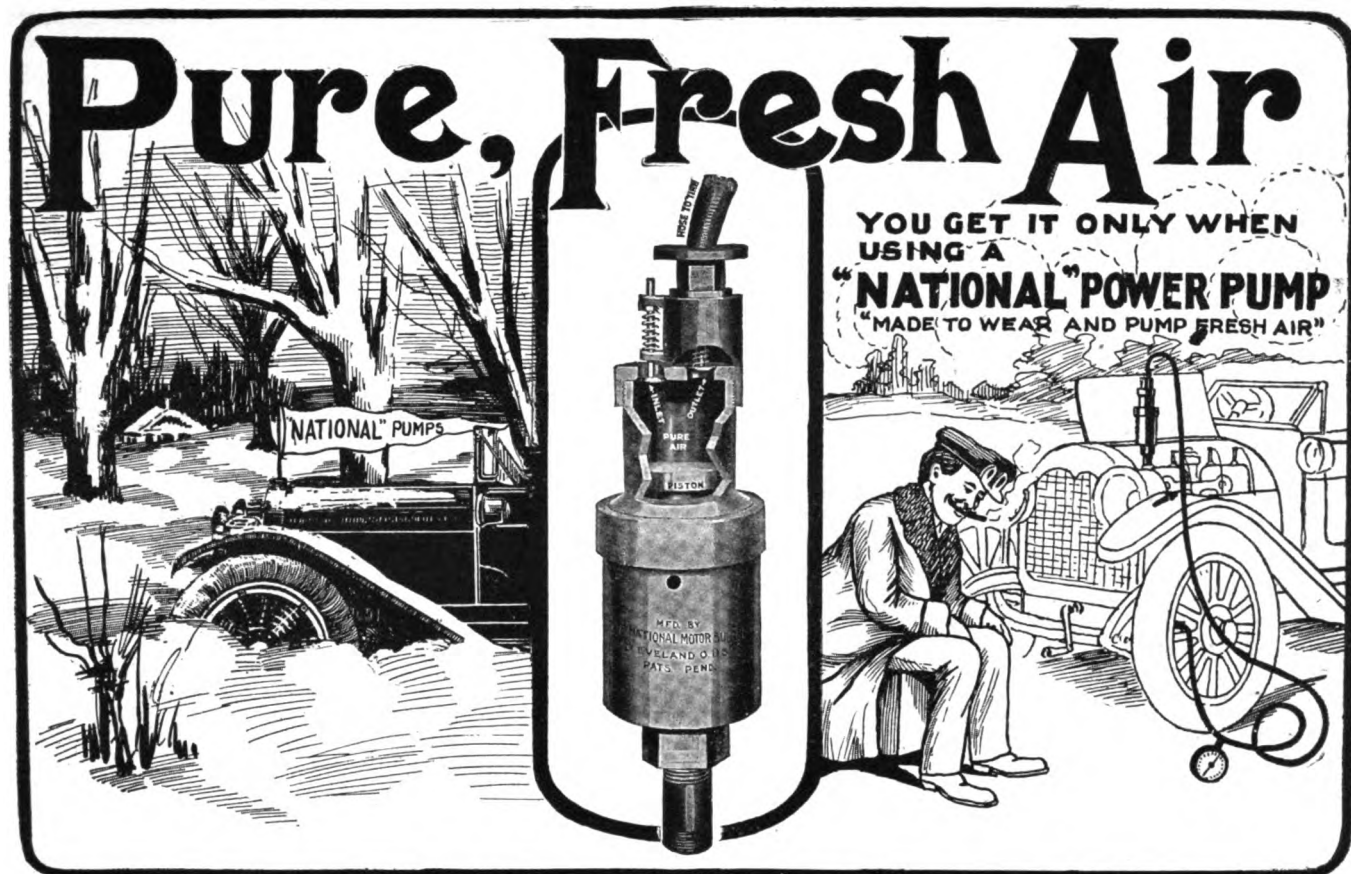
This is a handy device for the garage or repair shop. The illustration gives some idea of its appearance. For forcing bushings, removing or replacing gears, or straightening shafts it is extremely useful. It is made of structural and special threading steel. The screw is one 15-16ths diameter, and the nut is 4 inches long with a flange on the under side and a lock nut on the top side to hold it in place, while two dowel pins hold the nut from turning. The screw has eight threads to the inch and is made of special threading steel. The handle is fifty-four inches long, which gives the press enormous power. The thimble has a bronze seat and the end is heat treated. The screw turns in the thimble, so that the thimble sets on the



Post's Arbor and Gear Press.

shaft and forces it out without bruising or marring the shaft or bushings that are being worked. If a gear is a little too tight, this press has power enough to force it on and scrape the metal off the shaft. In forcing bushings, pins can be provided to go inside of the bushing with a shoulder to fit the bushing so that the pin will guide the bushing and force it straight to place. Some idea can be formed of the great strength of this press when three and four men can turn this screw with its fifty-four inch handle with safety.

Readers who may be interested should write for prices and particulars to Amos Post, Church street, Catskill, N. Y., and mention this magazine.



LET YOUR ENGINE PUMP UP YOUR TIRES!

A "National" Power Pump will save you many tired backs, also dollars for new tires.

Isn't it true that you often look at your tires and say, "Guess they need more air, but I haven't time, or don't feel like blowing them up by hand—I will let them go for a few days yet." You also know, and every tire manufacturer will tell you, that you pay dearly by neglecting this work. Now, if you had a "National" Power Pump, your tires would always be fully inflated. All you have to do is take off a spark plug, attach the pump instantly, and start the engine. That's the extent of the work. But best of all, your tires will be filled with **absolutely pure, fresh air**, if you use a "National." Not a particle of cylinder gas goes through our pump. "It is made to wear and pump fresh air." We have spared no expense to make it the very best in every possible way. Patented "Leak-proof" metal piston rings are used. Every valve is carefully ground separately. Special connections to make it easy to attach. The entire outfit is highly polished and nickel plated. Twelve feet of woven cover tubing are furnished, in the center of which is a high-grade pressure gauge which shows the exact pressure all the time. In ordering state whether you desire connection to have half-inch standard, A. L. A. M. or Metric thread. Sold on trial. Write for information. Price complete, \$15.00.

VULCANIZERS

WE MANUFACTURE THE MOST COMPLETE LINE ON EARTH. We have them from \$3.50 up to \$40. Get our prices and special offer on sales. Be sure to state whether you want one for your own personal use or for public garage.

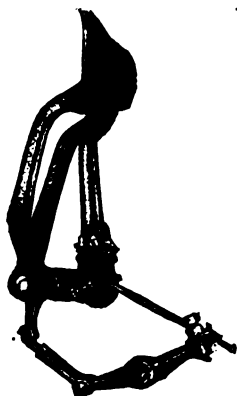
THE NATIONAL MOTOR SUPPLY CO.,
1920 EUCLID AVENUE, CLEVELAND, OHIO

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Apco Ford Specialties.

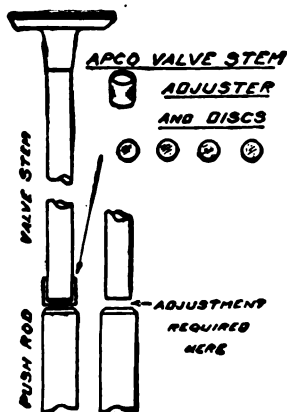
We want all our readers to understand that The Auto Parts Co. of Providence, R. I., are putting out a line of specialties for Ford car owners which ought to interest thousands of our readers. Especial attention is called to the attractive double page announcement in the present issue, and we illustrate herewith three prominent specialties for Ford cars, manufactured by this enterprising company.

The automatic clutch release here shown is a simple device which automatically releases the clutch on the



"Apco" Automatic Clutch Release for Ford Cars.

Model T, Ford, when the foot brake is applied. Pressure on the brake pedal releases the clutch before the brake is applied, and if you wish to coast you simply push the brake pedal forward which releases the clutch, and pushing the brake pedal farther forward applies the brake and brings the car to a standstill, without the use of the emergency brake or clutch pedal. This device will be found a great help to the amateur driver and also an important element of safety. It can be put on the car in ten minutes with a screw driver, and is guaranteed to outlast the car. The manufacturers offer to put this article out on two weeks' trial, and if not satis-



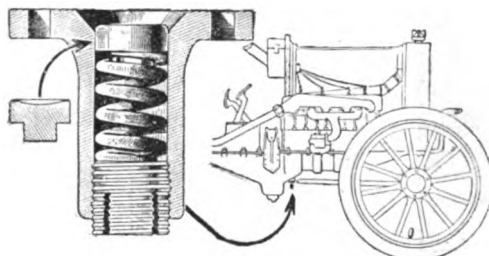
"Apco" Valve Stem Adjuster for Ford Cars.

factory, they will refund your money. This specialty will be sent to any reader complete for \$1, with directions for use.

We also illustrate an anti-rattling ball socket manufactured by the same company. This device is covered by letters patent. The illustration will give some idea of its appearance and method of application. Extending from the front axle of the Model T, Ford, back toward the rear is a triangle-shaped tube or torsion rod with a ball on the end where they come together. This ball fits into a socket on the bottom of the engine case and is held in place by a steel cap.

When the ball wears a little it has a tendency to rattle, and if the cap is taken off and filed down too much, the ball will be cramped and break off in going over rough roads. When the Apco socket here illustrated is used, the car requires no further attention in this respect, as the heavy spring automatically takes up the wear. The price of this Ford specialty is \$3.

We also illustrate the Apco Valve Stem Adjuster, another Ford specialty, which has been highly appreciated and on which the manufacturers have had a very large sale. If valve stems are not properly adjusted the car loses power, and this is a more important matter than many car owners have realized.



"Apco" Anti-Rattling Ball Socket for Ford Cars.

All the high-priced cars have an adjustment; and, by means of this device, Ford cars may have the same advantage. The Apco Valve Stem Adjusters consist of hardened caps made from Jessop's steel and a quantity of very thin hardened steel discs. To apply the adjusters, all that is necessary is to raise the valve slightly and slip an adjuster on the end. If this is not sufficient, put enough discs in the cap to reduce the play to the thickness of a piece of newspaper. The whole set can be put on in less than an hour, and the wear can be taken up very easily by inserting discs. The set includes eight adjusters and a quantity of discs to take up wear as occasion requires. The price of a complete set is \$1.50.

Another Apco specialty is a new front number plate holder for the Model T Ford. This is a simple and efficient device, and the price is so low that the owner cannot afford to have his plate hanging by strings and straps from the axle. The set consists of a pair of steel rust-proof brackets that fasten to the front spring clips of the T Ford. They hold the plate out of the mud and prevent all rattle; can be put on in two minutes and will last for years. This device will be found illustrated in the two page advertisement of this company in this issue, before referred to. The price is but 50 cents per set, prepaid, complete and ready to install, with nuts, screws, washers, etc.

We have only described and illustrated here a very few of the Ford specialties manufactured by The Auto Parts Co. They make in all forty of these Ford specialties and every one of our readers, if they are Ford owners, should write for their handsome and interesting illustrated catalogue. Send all orders and inquiries to The Auto Parts Co., Providence, R. I., and in all correspondence mention this magazine.

Automobile Repair Shop Instruction.

—The Atlantic Machine Company, 963 Atlantic avenue, Brooklyn, N. Y., now give a correspondence course of instruction in automobile repair shop practice. One advantage of this course of instruc-

tion is, that it is merely the development of a system of practical instruction that was found necessary and actually used in their shop for a number of years. This is undoubtedly superior to one that might be developed by an organization of the average correspondence school type, which inclines toward theory rather than practice. The arrangement of individual help to students by direct questions and answers is another feature that will undoubtedly attract attention. The provision of lesson folders in pocket size to enable the student to study on way to and from work is a convenience that will appeal to many. After completion of each section, the lesson folder is to be filed in the special binder provided and will thus form a convenient reference volume. For full particulars address as above.

A New Rubber Preserver.

The Essex Rubber Company, 258 Broadway, New York, is getting out what is known as the Essex Rubber Preserver, which is a new impervious coating for use on automobile tires or other rubber surfaces. This Preserver is effective as a coating for tires when they are laid up on cars for the winter, effectively sealing them from atmospheric influence. On running cars, this material fills the cuts and thoroughly coats any spots of exposed fabric. The Essex Rubber Preserver is poured out in a shallow dish, and when allowed to evaporate, forms a most effective plastic rubber, which can be used in filling deep cuts or punctures in the treads of tires. For full particulars, address as above.

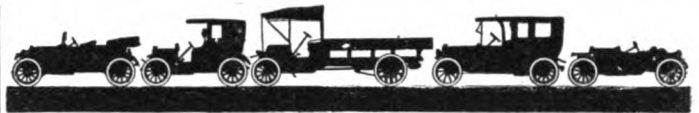
A Free Outfit for Dealers.—The Leather Tire Goods Company of Niagara Falls, N. Y., are sending free to dealers and garage men, outfits designed to assist them in selling Woodworth treads. They consist of a large display sign lithographed on metal in eight colors, a sample section showing the material and construction of Woodworth treads, and a quantity of literature giving full information about them. A unique feature of this sign is a pad of circulars which is bolted to it. These are perforated near the top enabling an interested person to tear one off and learn all about the goods without troubling the dealer. This outfit will be sent free by parcel post to any dealer asking for it and signifying his desire to sell Woodworth treads. Dealers not handling Woodworth treads should write immediately.

A New Spring Ball Socket.—For use on Ford front radius rods is being manufactured and placed on the market by the Royal Electric Company of Milford, Ind. It is claimed that this device effectively and permanently silences what is generally the most noisy part of this car.

The Right Light for Your Car.—The Prest-O-Lite Co., 251 East South street, Indianapolis, Ind., have a full page announcement in this issue, which will undoubtedly interest a good many of our readers, if they will turn to it and look it over. It refers to the lighting of your car. This company has prepared a booklet entitled "Light on the Lighting Problem" which will be sent to any of our readers who will turn to the advertisement of the company, cut out the coupon contained in it, fill in his name and address and send it to them. It is worth sending for.



THE HAIGHT AUTO LIGHTER
The Most Perfect Lighter on the Market.
Produces a good bright and steady light. Controlled from the seat.
Easy to light. Simply turn the hand wheel and the trick is done.
Neat in Appearance.
All exposed parts are nickel plated and very neat in appearance. Nothing is visible on the dash except the hand wheel and face plate.
SAVES GAS. Price reduced from \$20 to \$15, putting it within the reach of every auto owner.
AGENTS AND DEALERS—Write for our liberal proposition.
THE HAIGHT AUTO LIGHTER COMPANY, Lansing, Mich.



Mobiloil

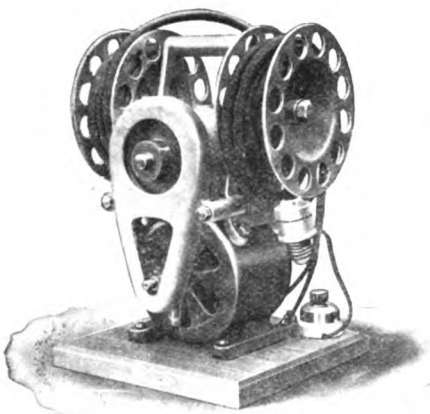
No one lubricating oil is best for all cars. Gargoyle Mobiloil gives you a grade for each type of motor. Use the grade shown in our complete recommendations. Mailed on request.

VACUUM OIL COMPANY, Rochester, U. S. A.

General Sales Offices, 29 Broadway, New York City.

The Abell Portable Garage Pump.

This plant consists of an Abell three-cylinder tire pump weighing about 40 pounds and driven by $\frac{1}{4}$ h. p. electric motor, for either direct or alternating currents. The pump is mounted on an aluminum casting, which is fastened to the top of the motor and has a handle to carry it by.



Abell Portable Garage Tire Pump.

It is mounted on top of a $\frac{1}{4}$ h.p. Holtzer-Cabot Motor. Reels are furnished to hold both wire cord and air tube. This arrangement is suitable for a small garage as it is compact, taking up but slightly more than one square foot of floor space. It is equally useful in the largest of garages even where an air-tank is already installed, as it is always ready for use, when the air-tank

pressure is insufficient, as is very often the case, and it can be taken to the car, in places where the tank pressure does not reach. A 34x4 tire can be inflated from dead flat to 80 pounds pressure in two minutes by the watch. The outfit includes twenty feet of electric cord and socket and fifteen feet of rubber hose with pressure gauge. This pump can be operated from an ordinary electric socket. No special wiring, rheostat or attachments are necessary. For further particulars and prices address Standard Thermometer Company, 65 Shirley street, Boston, Mass., and mention this magazine.

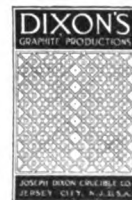
Preserv-O Tire Paint.—This paint preserves tires and increases mileage, so the manufacturers say, the Atlas Auto Supply Company, 3247 West Lake street, Chicago, Ill. They think so well of it, and believe our readers will think so well of it if they will only get acquainted with it, that they offer, in their advertisement on another page, to give a sample can to every reader of this paper who will cut the coupon out, fill in his name and address, and show it to his dealer.

Does Your Auto Top Leak?—If it does, communicate at once with the National Sales Company, Dept. "K," Kansas City, Mo., and get some of their 3-W Waterproof. This can be applied to leather, mohair, pantasote, duck or rubber. It is also excellent for seats and dust shields. It is easily applied and dries instantly. Does not crack, catch or hold dust. It can be furnished in all colors and only one coat is necessary.

One can covers from 40 to 50 square feet. Dealers generally keep it. If your dealer does not have it, write direct to the company, as above. See advertisement on another page.

"Lubricating the Motor."

This is the title of a booklet published by the Jos. Dixon Company of Jersey City, N. J. The second edition is now ready for distribution to the public and a copy will be sent to any reader of this paper who may be interested enough

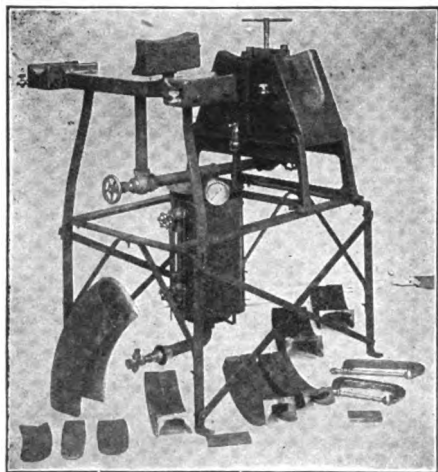


Joseph Dixon Crucible Co., Jersey City, N. J.

to write for it. With the book comes a chart with recommendations for lubricating each part of the car. A short description of one of the most remarkable automobile trips ever made, is also a feature, together with special chapters devoted to the lubrication of each part of the car and to motor boats, and motor cycles.

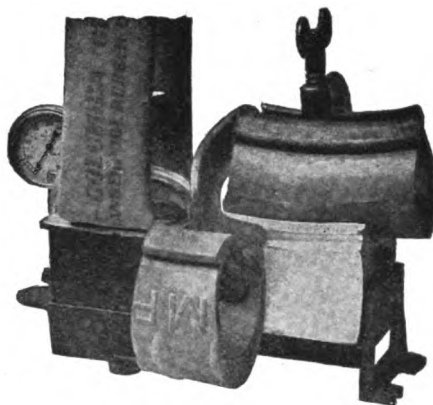
National Whistle.—This whistle fits any size exhaust pipe. No "couplings" or "fittings" required. It is said to be efficient and soot proof. Write for further particulars to the National Signal Company, Brooklyn, N. Y. Dealers are requested to write for special discount.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



SHOP OUTFIT

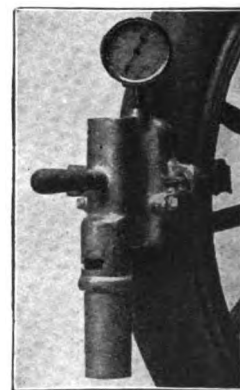
With reducing shell section work can be done on 3 to 5 inch cases. The tube plate has a tread mold on each end for the repair of cuts and blisters on cases, also one mold on top for the repair of the sides of cases. These are cured with pads and clamps. Boiler has 12 tubes, raises 40 lbs. of steam in about 15 minutes. This outfit, consisting of reducing shell, 5 pair bead molds, 2 clamps and pads, iron stand, gas or gasoline burner, \$80.00. Don't delay, get your order in before the spring trade opens up, for we are going to be pretty busy and you won't want to wait. For range, capacity, and economy of operation, this outfit has no equal. Ask us for our catalogue.



HANDY VAN STEAM VULCANIZER

Made for the Garage and Auto Owner. Price \$15.00. Just what you need. You would not do without it after a trial for twice the price. Equipped with gas or gasoline burner. Clamps, pads, and repair material. Repairs tubes and cases on the tread or sides in a first-class manner. Get busy and send in your order now before we get too busy to ship promptly. Do it now. It will soon pay for itself.

We want a live, hustling salesman to sell these in every town. Make big money. Get our proposition.



VAN STEAM PORTABLE

Repairs cases on the wheel. Every Auto Owner should have one. A great tire and money saver. Also repairs tubes. Price \$7.50. Generates steam with alcohol lamp. Furnished with repair material.

We want a live, hustling salesman in every town. Make big money. Get our proposition.

GUARANTEED TUBES AND RELINERS

	Tubes	Reliners
28x3 inches.....	\$2.50.....	\$2.00
30x3 ".....	2.60.....	2.10
30x3 1/4 ".....	3.51.....	2.75
32x3 1/4 ".....	3.83.....	2.85
34x4 ".....	5.04.....	3.25

Send enough to cover Parcel Post and price of Tube or Reliner. If any over we will return in stamps.

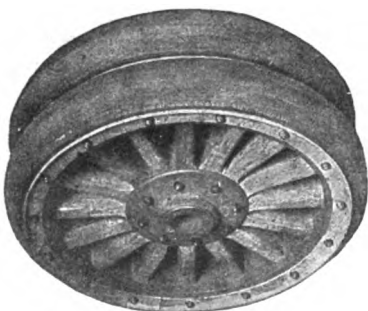
VANDERPOOL TIRE & RUBBER CO.

Springfield, Ohio.

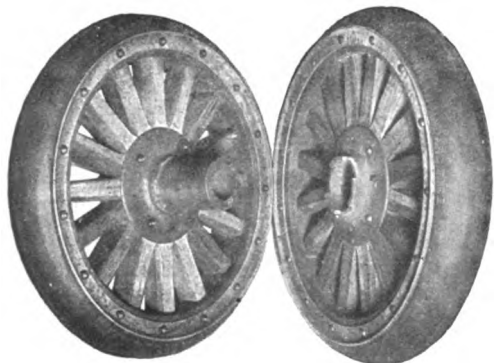
Phineas Jones' New Truck Wheels.

At the New York Auto Show, Phineas Jones & Co. of Newark, N. J., the well-known automobile wheel manufacturers,

A



B



A [New] Jones Wheel.

exhibited along with their pleasure car wheels, a new dual truck wheel patented by Phineas Jones. This wheel

was shown in two styles: One with demountable tires; one with pressure applied tires. Unlike the present so-called dual wheel which is merely an overloaded single wheel with two tires on same, this Jones' Dual Wheel consists of two separate wheels joined together at the hub, each with its own tire. They claim for this style of wheel that there is an absolute spoke support under each tire. The material to make these dual wheels is much easier to procure than the material to make the abnormal single wheel, and therefore is a lower priced wheel than the present style, while at the same time it is much stronger. The illustrations will give the reader a clear idea of the appearance of these wheels.

The Franklin Automobile Company of Syracuse, N. Y., has a page advertisement in this issue in which they make a special appeal to dealers, which every dealer ought to read. Cut out the coupon attached to the advertisement, fill in your name and address and send it to them and you will get the special proposition they have to make, and it may be well worth sending for.

Four-Cylinder Chicago Motor.—This motor is manufactured by the Auto Parts Company, 513 W. Jackson Blvd., Chicago, Ill. They are making a special price of \$140.00, and say that only a few will be sold at so low a rate. If you want a motor, perhaps it would be better to investigate this one by sending for full particulars, and then you can decide what to do.

The Franklin Dealer Proposition.—Every dealer who reads the advertisement of the Franklin Automobile Com-

pany, 29 Franklin Square, Syracuse, N. Y., on another page of this issue, is requested to write at once for their Special Dealers' Proposition.

Cut out the coupon, fill in your name and address and forward it promptly. This book will show why the Franklin dealership is a profitable one.

"Paint Your Car Yourself."—This sentence heads the advertisement of the Arsenal Varnish Company, 2501 4th avenue, Rock Island, Ill., which will be found in our advertising columns. This company has two pages in this issue giving full particulars about painting your own cars. They are publishing an attractive booklet entitled "The Car Beautiful." The latest edition is just off the press. It contains 36 pages, and deals exclusively with improving the car's appearance. The manufacturers say that to any man who owns a car this book is worth a dollar a page, so it would seem to be worth spending a two cent stamp or postal card on anyhow, and we would suggest that our readers cut the coupon out of the advertisement and write for it, or write for it without using the coupon and mention The Automobile Dealer and Repairer.

A Free Can of Body Gloss.—This is a preparation made by the Atlas Auto Supply Company, 3247 W. Lake street, Chicago, Ill. See advertisement on another page for description. It is easy to apply and economical. A pint will go over a touring car twice. In the advertisement of the company, on another page, will be found a coupon which, if presented to your dealer, is good for a sample can of this preparation.

WILSON HURT IN AUTOMOBILE

PRINCETON, N. J., Nov. 4.—Governor Woodrow Wilson attended to his correspondence today as usual, being little bothered by the scalp wound he received when his auto struck a mound in the road and jolted him against a rib in the roof of the car.

When the Governor met the correspondents he was wearing a narrow strip of colloid and gauze covering a wound three inches long. He said he would cure his wound as he had planned.

THE JOUNCE THAT BOUNCED WILSON!

COULD HAVE BEEN PREVENTED
HAD HIS CAR BEEN
EQUIPPED WITH

ACME TORSION SPRINGS

"DON'T JOUNCE" "DON'T BOUNCE"

Insurance for life of occupants, car, and easy riding.

Equip your car with Acme Torsion Springs.

Don't be fooled by "shock absorbers." What you want is *more* spring capacity under proper Automatic Control. Acme Torsion Springs add at least 18 feet to the total leaf spring area, every inch adding greater resiliency *automatically controlled*.

Acme Torsion Springs stop *vibration*, prevent *spring crystallization* and *breakage*, minimize *tire* and *engine* trouble, and improve the riding qualities of any car at least 75%. They cost less than half the price of shock absorbers, and are worth several times as much.

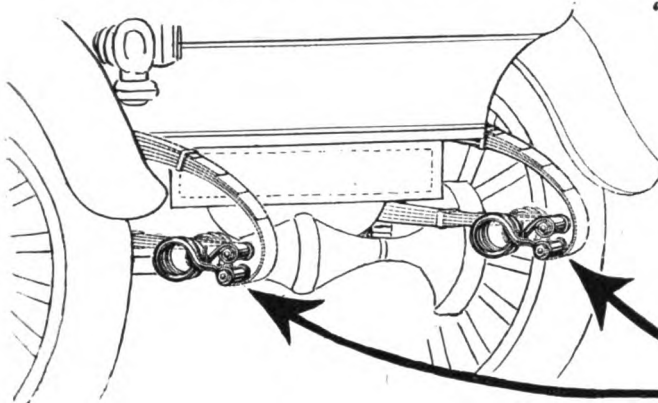
Eliminate Vibration and you eliminate trouble.

Adaptable to all types of leaf springs. Quickly and easily applied by anyone. Satisfaction guaranteed.

We have convinced thousands, let us convince you. Write to-day for information.

ACME TORSION SPRING equipment for FORD cars now ready.
FORD owners get our proposition.

ACME TORSION SPRING CO.
1000 Boylston St., BOSTON, MASS.



STEEL TIRE "ARMOR"

It is sold under an iron-clad Indemnity Bond, guaranteeing to make your present old tires—no matter what their condition so long as they have not yet burst—outlast any two or three new ones you can buy if used unprotected, and you will motor safely always, without possibility of Blow-outs, Punctures, Rim-cutting, or Skidding. Let us tell you How and Why it does it.

FROM FACTORY TO USER ONLY

It is priced with all middlemen's profits left out, and we deliver promptly, express prepaid.

Write to-day—now—for full particulars and our most generous first user's discount proposition ever offered. It is worth money to you. State size of your tires.

We are the largest manufacturers of tire protectors in the world, selling only direct to user.

DAVIS ROBE & ARMOR CO.
10 STATE STREET
CHICAGO, ILL.

Coupon
D. R. & A.
CO.

Send at once your liberal "first user's" proposition. I have not seen the IMPROVED DAVIS ARMOR here.

Name
Address
Size of my tires
My dealer's name is

A. D. & R., FEBRUARY, 1913.

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For Grinding Valves.—The Owen valve grinder is an excellent device for the purposes indicated. It is illustrated in our advertising columns. This handy tool weighs $3\frac{1}{4}$ pounds. It is simple in construction and easy to use. No pressure is required. Just rotate between the hands while resting on the valve and the grinding is done effectively and accurately. The price of this tool is \$2 including spring for lifting the valve. Of course, in connection with this tool a good valve seating compound is necessary and the same manufacturers are putting out a preparation called Gryndyn, which is ready for use and does not require mixing with oils and other compounds. The price of the Gryndyn is 35 cents a box, and one box is sufficient for considerable work. The compound also comes in 1-pound, 2-pound, and 5-pound cans. The Owen valve grinder and the compound mentioned are sold by nearly all up-to-date supply dealers, but if it is more convenient for you, orders may be filled direct. All correspondence should be addressed to Stewart & Co., 177 Broadway, New York City, and in writing them readers are requested to mention this publication.

Diamond Sundries for Automobiles and Tires.—One of the most interesting advertisements appearing in this issue is the full page announcement of the Diamond Rubber Company of New York, with factory at Akron, Ohio. This company is now a subsidiary of the B. F. Goodrich Company. In their announcement they give a list of the various sundries which they manufacture, not only for tires but for other things in connection with automobiles. The list includes, bumpers or springs, a full line of cements, including vulcanizing cement and wood rim cement, also tire patches, tire sleeves, tire bags, tire mats and matting, air pumps, horn bulbs, talcum, tape, tire levers, valves both for automobiles and bicycles, and a very complete line of tire repair material. Every reader of this publication should write without delay to the Diamond Rubber Company for their special tire and sundry automobile book, communications concerning this book should be addressed to the factory at Akron, Ohio, and a copy will be sent promptly.

Roy G. Harris, for the past three years in charge of sales and publicity for the Vreeland Chemical Company of New York, and previously for several years connected with the Grasselli Chemical Company of Cleveland, has recently joined the Firestone Tire and Rubber Company. Mr. Harris's position will be that of assistant advertising manager, with headquarters in Akron.

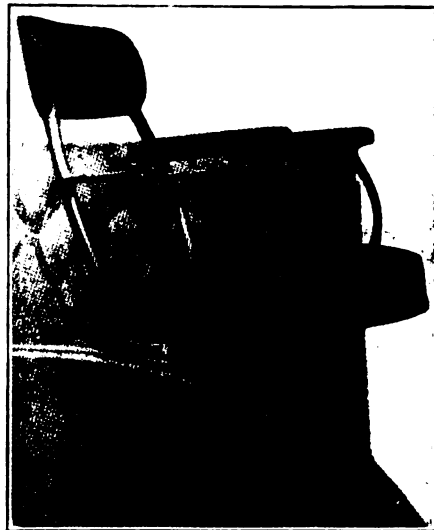
The Patterson Rubber Company of Lowell, Mass., has erected a factory for the manufacture of pneumatic tires and tubes and solid tires, as well as a full line of repair material and sundries. This factory will have a capacity of about 500 tires a day and about 1,000 tubes. The company expects to have its goods on the market sometime in the early spring, probably not later than the middle of April.

As we go to press, the Automobile Show at Newark, N. J., is in progress. This show has been a very successful one in past years and we have reason to believe that it will be even more successful at the present time, as the number of automobile owners in the State of New Jersey has greatly in-

creased during the last year and the interest in motoring has proportionately increased throughout the State.

Patent Luxury Folding Seats.

These seats are made of the best quality of drop steel forgings by skilled workmen. The seat and back are padded with best quality curled hair. The method of installing in the car absolutely does away with floor plates and protruding brackets. The seats are made in a wide variety of styles, and have been adopted as standard equipment by many manufacturers. These seats can also be readily installed in any old car. These seats are manufac-



The Latest Luxury Seat.

tured by Hodge & Graves Company of Amesbury, Mass. We show in the illustration a new style of Luxury Seat, having arms, and especially adapted for cars where there is abundant room, and known as Style F. Write direct to the manufacturers for catalogue and mention this magazine.

"Maintaining the Motor and How To Identify a Car" is the title of a little booklet—containing some useful information concerning the upkeep of cars—recently brought out by the Texas Company, 17 Battery Place, New York City. It will tell you something about the care of motor cylinders that you ought to know and also something interesting about the care of tires and about the car's appearance. It is well worth sending for. Drop a line to the Texas Company and get a copy, mentioning this notice in The Automobile Dealer and Repairer.

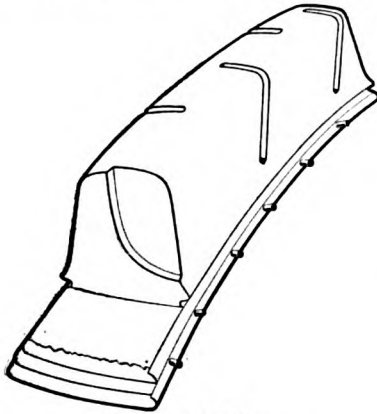
Rapid Roadside Repairs.—These can easily be made by providing yourself with a Goodrich Repair Outfit. See announcement of these outfits, briefly described on another page. For further particulars and price write to the B. F. Goodrich Company, Akron, Ohio, mentioning The Automobile Dealer and Repairer.

Send for free sample of The Automobile Dealer and Repairer.

MOTOR VEHICLE PUBLISHING CO.,
71-73 Murray St., New York.

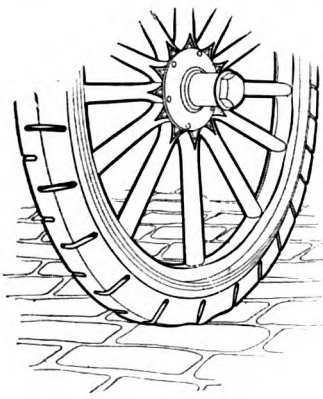
A New Non-Skid Solid Tire.

The St. Louis Tire & Rubber Co., University City, St. Louis, Mo., are manufacturing a solid resilient tire which they claim solves the skidding problem. The cross wires are placed in the base of the tire slanting both forward and backward to prevent the creeping of the tire when the wheel is running either forward or backward. This tire had been tried out in a quiet



Section of the Tire.

way for over two years, and it is claimed has proved a decided improvement over the ordinary solid tire. It will fit any clincher rim, whether detachable or single piece. The notches in the tire are at a slant of 20 degrees, and allow the tire to compress and spring with more cushion effect than has here before been realized in solid tires, and consequently are the next thing to pneumatics in resiliency. It consumes less



Showing its Resiliency.

current than the ordinary solid tire, the manufacturers say, while the notches in the side afford means by which it is easy to get out of a street car track when same is wet.

This firm also manufactures a pneumatic tire under an entirely new principle, which provides for the expanding of the carcass within the mold by hydraulic pressure, which insures against buckling and pinching of the fabric. It also provides for an equal distribution of the strain on all the layers of the fabric.

The Monarch Gas Lighter.—This new device is illustrated this month in an attractive advertisement on our inside front cover. This is a lighter which has been carefully designed and simplified. Push the lever, that's all, and the lamps are lit. The great feature of this lighter is the quick and effective lighting of the

gas lamps from the seat while the car is in motion, with a positive allowance of just the proper amount of gas to give an even flame to the burners. The operation of the lighter is entirely automatic. To turn out these lamps without getting out of the car, just turn the thumb screw controlling the valve to the right and the lamps are out. The manufacturers positively guarantee that it is impossible to blow off the lamps when turning on the gas. The Monarch lighter is furnished complete with best No. 12 Alco burners, genuine German lava tips, wire brass tubing, etc. with instructions for attaching in one hour's time, and the price of the complete outfit is \$6. Any car owner who wants one of these lighters will be readily satisfied. Address your inquiries and orders to the Benford Mfg. Co., 130 Pearl street, Mount Vernon, N. Y., and mention this magazine. This is the same company which manufactures the celebrated Monarch timers and spark plugs, and they have just put on the market a special spark plug for Ford car owners called the Peerless. The Peerless plug sells for the remarkable price of 50 cents. Yet, it is a thoroughly reliable spark plug. The Benford Mfg. Co. makes a special offer of four genuine Peerless plugs and the Monarch oil gauge, all for \$2, and an enormous demand for these specialties has already developed, and undoubtedly many of our readers will wish to take advantage of such a liberal offer.

National Tube Company's 1913 Edition Book of Standards.—The 1913 edition of the Book of Standards has just been received. The present edition which is the first since the 1902 edition is much larger and more complete than the older one. It contains 559 pages and is printed on Canterbury Bible paper, the book including the binding, being not quite five-eighths of an inch thick and will fit the pocket readily.

The information incorporated has made it strictly a pipe handbook and as such it is believed will find an immense use with the trade. The index of the book will be found to be very complete, all headings being thoroughly cross indexed. There are approximately 4,000 references found in the index. Several pages are devoted to a descriptive article covering the main process of manufacturing both welded and seamless tubes, also giving information in regard to the threading durability and physical properties, etc., of both "National" Pipe and Shelby Seamless Steel Tubes. There are a number of pages which give weights, dimensions, threads per inch, test pressures, sections of joints, specifications, etc., of the various kinds of pipes and tubings made. An article on Protective Coating, Matheson Joint Pipe, and Converse Joint Pipe contains desirable information on these subjects.

This work is a marvel of information in relation to the broad field which it covers, and consumed nearly four years of hard work in its preparation. The price is \$2 a copy, and it may be had by sending this sum to the National Tube Company, Pittsburgh, Pa.

Send for free sample of The Automobile Dealer and Repairer.
MOTOR VEHICLE PUBLISHING CO.,
71-73 Murray St., New York.

THIS GASOLINE GAUGE IS MADE ESPECIALLY TO FIT YOUR TANK



Here is a gauge which tells you exactly the amount of gasoline in gallons, which you have in your car, no matter whether your tank is square, round or oval. It eliminates all guess work and chances because it is adjusted to suit the tank on your car. Variations or mistakes are impossible. It is the only reliable measure for round, oval or irregular tanks.

GASOLINE GALLON GAUGE

Handsomely finished in black stained wood with 20 or more movable brass gallon markers.

When you first receive your gauge, fill your tank, a gallon at a time, adjusting each marker as necessary to give the correct reading. That's all there is to it. The marking is then permanent—unless you want to change it. The gasoline level shows clearly on the black finish. Outside marker is moved to show level of last reading—a valuable check on your mileage per gallon. It plainly shows if somebody is taking your gasoline, whether there is a leak, whether someone is using your car, etc., etc.

Price 50 Cents

15 inches long, 20 brass markers. Additional markers if needed, at same price.

Or made to order up to 24 inches long for extra deep tanks. 1 to 30 markers as necessary.

Price 75 Cents

Send money order, stamps or coin.

Order One Today.
Sent postpaid anywhere in the United States.

Patented March 5, 1912.

GOODNOW MFG CO.
753 OLD SOUTH BLDG,
BOSTON, MASS.

Classified Advertisements

Under this head will be printed advertisements of **Second Hand Cars Wanted** or for **Sale, Accessories of any kind Wanted** or for **Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines For Sale or to Exchange**, at the uniform price of three cents a word, including the name and address, for each insertion, payable in advance. No advertisement will be inserted for less than 50 cents, however small. Remittances may be made in postage stamps or in any convenient way.

Classified Advertisements

Address **MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York.**

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., N. Y. City.

PATENTS SECURED—C. L. Parker, Patent attorney, 962 G Street, Washington, D. C. Inventor's Handbook upon request.

CYLINDERS REGROUND, and fitted with new pistons and rings for \$15.00 per cylinder. We make parts and cut gears of all kinds. Send us your old parts and we will repair or duplicate them in record time. Cracked cylinders, gear cases, etc., welded and made good as new. Aluminum, bronze and brass castings of every description. Phosphor bronze bushings in the rough carried in stock. Address, The Adapt Machinery Company, 1624 Wabash ave., Chicago, Ill.

DON'T FORGET.
FORD AGENTS—WE MAKE A SPECIALTY of Dust Hoods to cover Top when clashed down for Model T Ford 1910-1911-1912-1913 Cars. Write for prices, also Cellulose, best Substitute for Glass used in Automobile and Buggy Storm Fronts, Side Curtains, etc., Sheets 20 x 36 in. 86c., 12x20 in. 36c., 18x20 in. 45c., 20x24 in. 68c., postpaid. Haews Storm Front Co., Coldwater, Mich.

AUTOMOBILE boilers bought, sold and repaired. Lucas & Son, Bridgeport, Conn.

MODEL T FORD OWNERS—You need my valve adjusters. They make a good car better. More power, better mileage, less noise. A good proposition to owner agents. Ira Lavender, Webster City, Iowa.

NEW ENGLAND AUTO LIST and TOURIST—Includes weekly list of all N. E. Auto Owners, Garages, Dealers, etc., with maps and selected N. E. routes, \$10.00 yearly. 138 Pearl st., Boston, Mass.

50 NEW pressed steel auto frames 163 in. long, 34 in. wide. Send for sketch. \$10.00 each. Lucas & Son, Bridgeport, Conn.

DELIVERY CAR, closed body, 10 h.p.; just spent \$100 overhauling, \$150 new body and painting; will sell \$200. Chatfield, 312 W. 52d st., N. Y. City. (Telephone.)

PORTABLE GARAGES.

Garages—Portable-permanent, steel or wood Knapp System, 123 Liberty st., New York City, N. Y.

TOPS REBUILT, recovered and repaired. For particulars address C. G. Meyer & Son, Tiffin, Ohio.

CYLINDERS REBORED, pistons and rings fitted, gear cutting of all kinds and materials, transmission and bev. gears of nickel steel hardened and tempered, guaranteed better than factory, crank shafts, connecting rods, crank cases, axles, any part of auto or motor reproduced like original, phosphor bronze bushings carried in stock, send old or broken parts to go by. The shop of quality, McCadden Machine Works, Minneapolis Branch, Minneapolis, Minn.

WELDING—\$\$\$\$\$\$ saved on auto parts. Ship all broken castings to us. Save time and \$\$\$\$\$\$. National Welding & Mfg. Co., Incorporated, Mfrs. of Complete Welding Plants, Welders and Brazers of all Metals, 526 Jackson blvd., Chicago, Ill.

WHEN your tires or tubes need repairing, send them to us. Our prices are lowest, we are always prompt and reliable. We sell all kinds of tires and accessories at special prices. It will pay you to "Get Acquainted." New York Steam Auto Tire Works, 312 West 52nd st., New York City.

TRUCK AGENTS WANTED

COMMISSIONS PAID without the purchase of demonstrator. If you have any prospects send for catalogues and discounts, 1,500 lb., 2,000 lb., 3,000 lb., 4,000 lb. Four cylinders. S. A. E. tires, all oversize. Ideal Auto Co., Fort Wayne, Ind.

BROKEN CRANKSHAFTS, crankcases, cylinders, flywheels, garterteeth, pistons, perfectly welded and machined ready to replace. Scored cylinders made new. Booklet, Atlas Welding Works, Rahway, N. J.

FORD OWNERS WANTING FIVE ELECTRIC LIGHTS available any time using Ford magneto for charging a storage battery (self-contained system), write American Battery Company, 1126 Fulton st., Chicago.

FORE DOORS.

Made for all makes of cars. Prompt shipment guaranteed. F. E. Lortz Co., 2503 E. 55th st., Cleveland, O.

GOOD AGENTS WANTED

To sell new invention for automobiles. Saves 1-3 gasoline. Don't delay. Write us at once for territory. We have salesmen making \$50.00 per week. Natl. Mfg. Co., Kalamazoo, Mich.

MAKE YOUR OWN POLISH—\$10.00 will pay for thorough process, making high grade metal polish 25 cents per gallon. Instructions, formula, enough chemicals to mix up eight gallons included. Or start paying business of your own. Address Chemist, P. O. Box 654, New York City.

WELDING, broken cylinders, crank cases and crank shafts welded. Cylinders rebored including pistons and rings. \$7.00 to \$11.00. Sterling Engine Co., 331-333 S. Clinton st., Chicago, Ill.

KEROSENE FOR AUTOMOBILES—New Model B uses successfully half and half mixture, lowest grades kerosene and gasoline. Satisfaction guaranteed or money refunded. Greatly increased power, very slow speed on high. Starts easy at zero. Special agents' prices. Dept. A-8. The Air-Friction Carburetor Co., Dayton, Ohio.

APPLY BOYER'S AUTOMATIC REFINISHER to your automobile today. Tomorrow it will look as though it just came from the factory. Finest thing in the world for dull hoods. Easily applied with cheesecloth. Particulars free. Boyer Chemical Laboratory Co., State and Michigan Sts., Chicago.

BROKEN CYLINDERS and crankcases welded. Worn cylinders rebored. Scored cylinders repaired, \$12. See our ad page 21. Waterbury Welding Company, Waterbury, Conn.

LARGEST SUPPLY HOUSE IN THE WORLD
4-Cylinder motors, new.....\$100.00
Planetary transmissions.....10.00
Selective sliding gear transmissions 35.00
Fore-door body upholstered and painted.....60.00
Solar Head lights.....per pair 6.00
Send for our Bargain Sheet
AUTO PARTS GO.
513-31 W. Jackson Blvd.
CHICAGO, ILL.

FOR SALE—Amsco Headlight on swivel bracket \$5.00. Pair drop brakes \$1.00. Nightingale whistle \$3.00. Buffalo carburetor \$3.00. Old headlight and generator \$1.00. Arnold, Grenoble, Penna.

FOR SALE—Never used Rely Type "S" four-cylinder Magneto. Price \$20.00. Perfect condition. Great Bargain. Address Cooley & Son, Montrose, Penna.

FORD MODEL T. REFERENCE BOOK locates the 17 causes of missing, the 14 of lost power, 13 of overheating, 9 of knocking, the dozen other annoyances that bother you and shows how to fix them at once. For Ford cars only. Write for full descriptive circular, or sent postpaid \$1.00. Ford Reference Book Co., 57 West 125th St., New York.

FOR SALE—BEST FIREPROOF GARAGE in Western Pennsylvania. Agency for four old reliable cars; large accessory business; established eight years. If you want to get in the automobile business, investigate. Owner going to retire. Address Geo. M. Seaman, Farmers' Bank, Pittsburgh, Pa.



The Livingston Radiator PROVED BY TEST

Radiators made or repaired for any type car.

Have a new radiator made for your car and increase its value 25 per cent.

Our corps of expert repairmen at your service. All charges based on time consumed. Results guaranteed.

Send in your old radiator and get estimate.

LIVINGSTON RADIATOR AND MFG. CO.

136 W. 53d St., New York City

Please mention the Automobile Dealer and Repairer when writing to advertisers.

WANTED—A good reliable all around man to take charge of small garage in one of the best towns in southeast Missouri. Must be sober. Good opportunity for the right man. Write for information to Sikeston Garage, Sikeston, Mo.

FOR SALE—Machine shop and garage in good live town of four thousand in southeast Missouri. Lots of machinery and cars. Worked seven men this winter. Parties interested must act quickly. Address George Falszt & Sons, Sikeston, Mo.

SITUATION WANTED with accessory manufacturer or supply house by young, energetic man thoroughly experienced in the wholesale, retail and mail order supply and tire business. Good salesman and buyer and competent as correspondent, advertising and catalogue man. Would like to connect with a good reliable concern. Address G. Automobile Dealer & Repairer, Box 654, N. Y. City.

POSITION WANTED—By an experienced automobile man. Garage worker or driving. Married. Good references. South Dakota work preferred. Address Box 41, Burdette, So. Dakota.

FORD OWNERS—A Royal Spring Ball Socket stops that radius rod rattle permanently. One sent prepaid for dollar bill. Royal Electric Co., Milford, Ind.

CHEAP CARS—Model "F" Cadillac, \$95.00. Model "T" Ford Touring, \$325.00. Rambler 36 Touring, \$350.00. Address Royal Garage, Milford, Ind.

SITUATION WANTED—All around repair man wants position in garage, repair shop or small factory. Have had four years experience with automobiles. Good references. Address Henry Schreiner, 5415 Devoshire Avenue, St. Louis, Mo.

FOR SALE—5 H.P. Marine engine, just overhauled, fine for boat or shop. First draft for \$15.00 takes it. Address E. Tople, Newcastle, Ind.

AUTOMOBILE model. Every part shown and named. You can to all intents and purposes take off the wheels, raise the hood and remove the body; exposing to view the vital parts. The most practical method of studying the automobile. Price, 50 cents postpaid. Ppular Mechanics, Dept. A. D., 318 W. Washington St., Chicago.

WANTED! EXPERT VULCANIZER

TO TAKE CHARGE of old established business in Western N. Y. City of 250,000 population, or would sell one-half interest to the right man. Address M. V. W., care Automobile Dealer and Repairer, P. O. Box 654, New York

Subscribe to the "Automobile Dealer and Repairer" \$1.00 Per Year.

The M. & M. Economizer.—This device is a carburetor adjuster which is inserted into the manifold. It is made with one valve and six port-holes to increase the speed and power of the car. It is also an economizer, because it enables the car owner to cut out all gasoline and ignition while descending grades, slowing up for crossings, and turning corners. What the coaster brake is to the bicycle, the M. & M. is to the automobile. Every one of our readers should investigate the merits of this remarkable invention. The manufacturers offer to positively refund the money in thirty days if this device is unsatisfactory after a trial. The same invention has been adapted to motor cycles. The price of the automobile size is \$3.50 f. o. b. Philadelphia, and it will be necessary for the purchaser to send 17 cents extra for postage. The price for the motor cycle size is \$1.25 prepaid. The offer to put these economizers out on thirty days' trial is absolutely genuine, and our readers may take advantage of it, with confidence that the manufacturers will live up to their promises in the matter. Address your orders to Moller Bros. Controller & Economizer Co., 700 Betz Building, Philadelphia, Pa., and mention this magazine.

Motz Non-Skid Cushion Tires.—These tires are said to end tire troubles and protect the car. Particular attention is directed to the Double Notched Treads and Undercut Slides of these tires. But consult the advertisement of the Motz Tire and Rubber Company of Akron, Ohio, on another page, and write to them for further particulars. Particulars concerning these tires will be sent in a booklet to any reader who will take the trouble to write for it.

Capital Gun Metal.—This is a perfect alloy of copper and tin, which has the appearance of gold and in addition is guaranteed to be ductile, malleable, homogeneous, with absolutely non-corrosiveness, great tensile strength, capable of high polish, is adapted for machine parts, valves, bearings, springs, etc. Write for catalogue giving full particulars and prices to Edgar T. Ward & Sons, Boston, Mass.

Mosler Spit Fire
Plugs
ARE THE BEST
A. R. MOSLER & CO.,
P. O. BOX "M",
MT. VERNON, N. Y.



AUTOMOBILE OWNER

If you are tired paying the usual high list price for Auto Supplies and Tires, write for our 35% catalog.

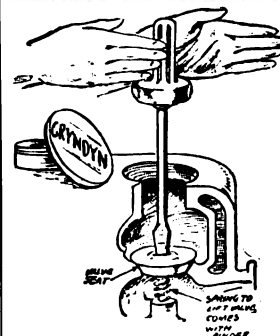
35% Automobile Supply Co.

97 Chambers St., New York.
1508 Michigan Ave., Chicago, Ill.
236 Peachtree St., Atlanta, Ga.

Moore Tire-Saving Jacks
\$6.50 Per Set of Four. 20,000 Sets in Use.
MOORE Jacks save tires by relieving them of heavy weight of car. Easy to apply—simply slip padded loop over hub and press down lever. At dealers, or sent prepaid on receipt of \$6.50.
J. C. MOORE & CO.
326 WISCONSIN ST. RACINE, WIS.

GRIND YOUR VALVES with **GRYNDYN** and give your engine a chance **TO SHOW YOU. IT CUTS FAST** and produces a smooth, even surface.
GRYNDYN is the **SHORT CUT** to good compression. **IT SAVES TIME.** Full directions with every box. In screw-top tin boxes—Price 35c. Also in 1-lb., 2-lb. and 5 lb. cans.

THE PERFECT VALVE SEATING COMPOUND
FOR ALL GAS & GASOLINE MOTORS
GRYNDYN
TRADE MARK
READY FOR USE. DO NOT MIX WITH OILS OR OTHER COMPOUNDS.
MANUFACTURED BY **STEWART & CO.**



THE OWEN VALVE GRINDER

Weight 3/4 lbs. No pressure required. Easy to use. Simple in construction. Just rotate between the hands while resting on valve. Made of steel and thoroughly warranted.

Price, Each \$2.00 Including spring for lifting valve. Sold by all up-to-date supply dealers.

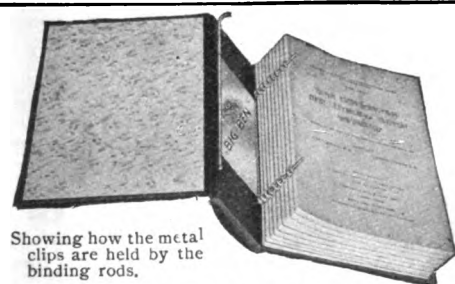
Pat. Applied for **Manufactured by STEWART & CO., 171 Broadway, New York**

TOOL MAKING.

By **EDWARD R. MARKHAM**, American Society of Mechanical Engineers, Instructor in Machine Shop Work, Harvard University and Rindge Manual Training School, formerly Superintendent Waltham Watch Tool Co., 225 pp., 325 illus. Cloth binding. The whole subject is here exhaustively treated and profusely illustrated. The information given is of inestimable value to all machine shop men, metal and wood workers, and a'l whose tasks may occasionally call for the exercise of mechanical skill, ingenuity, and inventiveness in the devising of special means to accomplish special ends. Price.....\$1.50

Sent to any address, postage prepaid, on receipt of price.

M. T. RICHARDSON CO., Publishers,
71-73 MURRAY STREET, NEW YORK.



Showing how the metal clips are held by the binding rods.

THE "BIG BEN" BINDER

preserves them in permanent BOOK FORM. This binder is handsome, durable and convenient. It opens flat like a regularly bound book, Cloth Covered, with the name of the magazine stamped in gold. For persons who desire to

SAVE THESE VALUABLE ARTICLES

this binder is just the thing, as it can be used year after year, by simply taking out the oldest numbers and inserting the new ones as they come to you, or you can keep each volume in a binder as a permanent bound book which will be a valuable addition to your library.

By making special arrangement with the manufacturers of this best binder that has ever been put on the market, we are able to furnish them to you for

ONLY \$1.00 EACH

Merely send us your name and address and enclose this amount and we will send the binder promptly, all charges prepaid.

Send in your order now and begin making the magazine doubly valuable to you, at once. Address all orders to

THE AUTOMOBILE DEALER AND REPAIRER, :: 71-73 Murray St., New York City

BIND YOUR MAGAZINES In PERMANENT BOOK FORM

We have succeeded at last in securing a really practical binder

"It's as simple as filing papers"

Our magazine contains many articles and a great deal of valuable information and data worth saving for future reference. There is only one way of keeping them.

YOU NEED A

MOSSBERG

SOCKET WRENCH SET

No. 14

The Most Complete of all
Socket Sets

Your Best "Friends" When in Trouble

100% EFFICIENT
in REPAIR WORK

SAVES TIME, TROUBLE
AND TEMPER

Catalogue No. 143



SOCKET WRENCH
SET No. 14



MOSSBERG
ATTLEBORO, MASS.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

\$2,000,000 Buried

By R. E. Olds, Designer

In Reo the Fifth, we bury at least \$2,000,000 a year where few men ever see it.

That's somewhere about \$200 per car.

It is not merely hidden. It is spent on extremes—on over-caution, some say.

And it may take months—even years, sometimes—to discover all that this buried money buys.

Not Charged to You

This hidden cost is not added to your bill. The price of this car will show that.

We save it all—and more besides—by unusual factory economies.

In one way alone—by building only one model—we save 20 per cent.

By not changing models in any radical way we save a great deal more. That comes from right designing.

We build all our own parts.

And our factory efficiency is so well known that engineers from everywhere come here to inspect it. Magazine articles have been written about it.

That's the whole reason why a car like this can be sold for \$1,095.

You Get Twice What You See

In Reo the Fifth you see a beautiful car—roomy and rich and impressive. The body is finished in 17 coats. The upholstery is luxurious. Every detail shows the final touch.

Flush electric dash lights instead of

the side lamps. Nickel trimmings, even under the hood.

But don't judge a car by these showy externals. That's mere body-building—easy, usual and cheap.

What to Consider

The chief points in a car are endurance and safety. And those depend largely on steel.

So I have steel for each part made to my formulas, based on 26 years of experience. Then I analyze each part—analyze it twice—to prove its accord with those formulas.

Then I give each important part vast overcapacity. I employ the same tests as are generally used for a 45 h. p. engine.

Instead of steel castings, which cost half as much, I use in this car 190 drop forgings. Thus hidden flaws are avoided.

Roller Bearings

I might say Timken bearings and use only two. But I use them for endurance, not claims.

There are no ball bearings in Reo the Fifth, save in the clutch and fan.

There are 15 roller bearings. The usual ball bearings would cost one-fifth as much.

I use a \$75 magneto.

I use a centrifugal pump.

My carburetor is double heated—with hot air and hot water. That saves a world of trouble.

I use 14-inch brake drums. I use 2-inch, 7 leaf springs.

Tires 34x4

This car is vastly over-tired, and tires, as you know, are expensive.

I spend on tires about \$80 per car more than other experts think neces-

sary. But nobody doubts that I save my users three to five times as much.

Then my tests and inspections are immensely expensive. I test my gears in a crushing machine with 50 tons' capacity. I test my springs in another machine, for 100,000 vibrations.

Each engine is tested 20 hours on blocks, and 28 hours in the chassis. I use three 10-hour tests which are very unusual.

Each car in the making gets a thousand inspections.

Parts are ground over and over to get utter exactness. And our output is limited to 50 cars daily, so no man is ever rushed.

Ideal Center Control

The leading cars, as you know, have come to left side drive. Also to center control.

But center control, in Reo the Fifth, doesn't mean the old side levers moved to the middle.

Our center control is a sort of cane handle. All the gear shifting is done by moving this handle only three inches in each of four directions. It's as easy and simple as moving the spark lever.

No reaching, no levers in the way. Both brakes are operated by foot pedals. Thus both front doors are clear.

The driver sits on the left hand side, close to the cars he passes. Yet his right hand controls the car.

This exclusive feature costs nothing

extra. But if it cost \$100 men would pay it, I believe.

My Idea of a Car

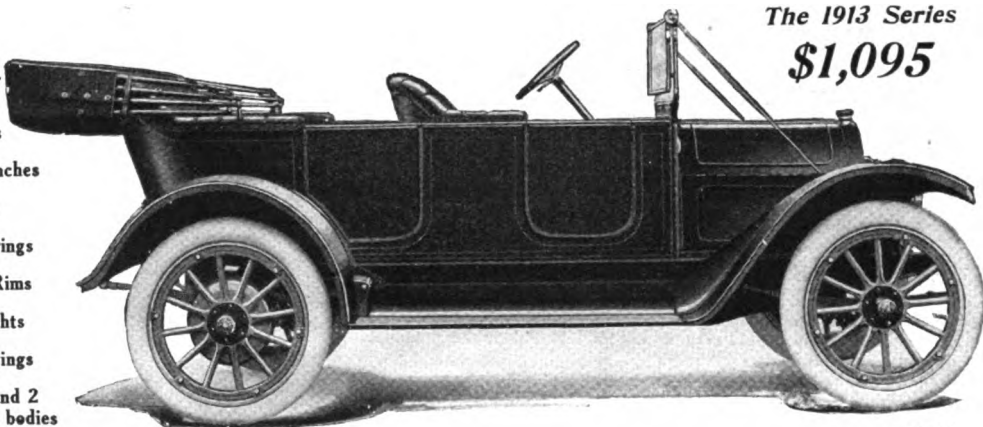
This is my idea of an honest car. It is the final result of 26 years spent in building cars.

I would not buy a car built otherwise myself. So I shall never build one.

My success is due to these extreme ideas. So are my legions of friends among motor car users. This year I am seeking for 10,000 more such friends.

A thousand dealers now handle Reo the Fifth. Write for our 1913 catalog and we'll give you the address of the nearest.

30-35
Horsepower
Wheel Base—
112 inches
Tires - 34x4 inches
Center Control
15 Roller Bearings
Demountable Rims
3 Electric Lights
190 Drop Forgings
Made with 5 and 2
passenger bodies



Reo the Fifth

The 1913 Series

\$1,095

Top and windshield not included in price. We equip this car with mohair top, side curtains and slip cover, windshield, gas tank for headlights, speedometer, self-starter, extra rim and brackets—all for \$100 extra (list price \$170).

R. M. Owen & Co., General Sales Agents for **Reo Motor Car Co., Lansing, Mich.**

Canadian Factory, St. Catharines, Ont.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



OUR reputation is at stake every time an accessory you sell is used in roadside repairs.

Your reputation will be maintained, your business will be advertised by the handling of Firestone Accessories.

The same tried, expertly used and inspected materials which have made Firestone Tires the choice of the knowing car owner, the same careful attention to detail and mastery of design are employed in the manufacture of

Firestone

ACCESSORIES

Why, then, take chances on experimental accessories when you can be sure with the accessories which have never shown a weakness?

"Cure Cut"—Keeps moisture from entering tread cuts and punctures, prevents serious tire troubles.

Cementless Patches—For quick, handy roadside repairs. Highest quality, surest design, satisfactory results.

Blow-out Boots—Extra long, stretched with double flaps for locking around each bead. Made from highest quality fabrics.

Pure Gum and Red Wrapped Tube Patches—Full of stretch, easily and securely applied with Firestone 1041 Cement. Cement is furnished in tubes or one-quarter pint cans up to one gallon.

Repair Materials in Packages—Emergency Patches—Lace-on-Boots—Complete Repair Kits, etc.

Get our Proposition. It Holds Big Profit Possibilities for You.

The Firestone Tire & Rubber Co.

"America's Largest Exclusive Tire and Rim Makers"

Akron, Ohio

All Principal Cities



Franklin Dealer Proposition

This book will show you why the Franklin dealership is a profitable one. Send in your application at once.

The dealer who handles the Franklin has a car with six exclusive features, each one of which is a sales clinching fact.

ENTZ ELECTRIC STARTER AND LIGHTING SYSTEM

A real self-starter with really original features. You throw the switch "on" and the motor starts—no buttons, levers or pedals. In crowded traffic, if you slow the engine down to where it would ordinarily stall, the starter picks it up and starts it running again without any action on the part of the driver. A permanently connected starter without change gears.

THESE ARGUMENTS SELL FRANKLIN CARS

These are the arguments you can bring to bear upon the prospect when you show him the Franklin: (1) Uses less gasoline; (2) Uses less oil; (3) Wears out fewer tires; (4) Travels faster in the long run; (5) Rides easier; (6) Lasts longer.

Franklin dealers are making money and Franklin sales are increasing steadily every year. The Franklin now stands third in sales among all high-grade cars, and rapidly gaining on second place. The "Franklin Dealer Proposition" shows why this is so.

A PERMANENT BUSINESS CONSTANTLY INCREASING

One of our dealers says: "I could not very well drop the Franklin if I wanted to. Everywhere I have sold them I have created a permanent business. Franklin owners come back year after year."

The Franklin dealer does an all-year-around business. This means a profitable garage business. Franklin cars keep going summer and winter. They keep going because Franklin direct air cooling is not affected by weather conditions. They keep going because the owners can afford to drive them. They do not cost heavily to operate. If you sell Franklin cars in your territory you have a steady year-around demand for gasoline, oil, tires and accessories.

CONTINUOUS PRODUCTION INCREASES SALES

Our continuous production policy makes the Franklin dealership a good proposition for the dealer. You can always offer the very latest model with the newest equipment. There are no "off months" waiting for the so-called yearly announcements. Franklin dealers do a good business every month in the year.

SEND FOR FRANKLIN DEALER PROPOSITION

Chicago increased sales over last year, 185%; Philadelphia over 357%; San Francisco over 200%; New York over 72%; Boston over 104%; Cincinnati over 500%. There is a big increase all along the line.

The Franklin Dealer Proposition will explain how you can get your share of this big increase.

Franklin Automobile Company, 29 Franklin Square, Syracuse, N. Y.

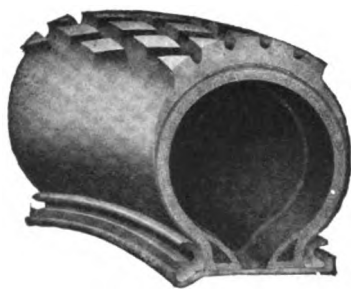
DEALER APPLICATION

FRANKLIN AUTOMOBILE COMPANY
Syracuse, New York

Please send "Dealer Proposition" as advertised in February Automobile Dealer and Repairer.

Name.....
Address
Available Capital
Shop Facilities.....
Three references.....
.....
.....
Cars handled now.....

Please mention the Automobile Dealer and Repairer when writing to advertisers.



No-Rim-Cut Tires

10% Oversize

All Tiredom Records Broken

This Coming Season

Will You Still Over-Spend for Tires?

You who don't know No-Rim-Cut tires waste a pretty large share of your tire money.

Note this convincing evidence:

Men who do know bought last year 918,687 Goodyear tires. And they wanted 400,000 more.

They bought more than men bought in the previous twelve years put together.

The demand has broken all records of Tiredom, after countless mileage tests.

Look at This Tire

You can see that rim-cutting is made completely impossible.

There are no hooks on the base as with old-type tires. The removable rim flanges are set to curve outward.

The tire, when wholly or partly deflated, rests on a rounded edge.

The tire is held on by our patented feature—by six flat bands of 126 braided wires vulcanized into the tire base. That makes the tire base unstretchable. The tire can't be forced off, and yet it slips off like any quick-detachable when you remove a rim flange.

We control the only way known to make a satisfactory tire of this type.

See the Oversize

You can see that these tires are oversize, compared with clincher tires.

We claim but 10 per cent. But careful comparison of air capacity shows an actual average oversize of 16 7 per cent. We compared with six makes of clinchers.

Even 10 per cent oversize, under average conditions, adds 25 per cent to the tire mileage.

See the Non-Skid

Compare this Non-Skid with all other non-skids. You can see for yourself the tremendous advantages.

Note that we here add a complete extra tread, making a double-thick tread.

This extra tread is a very tough rubber. So the non-skid feature is immensely enduring.

The blocks are deep-cut and sharp-cut. Countless edges and angles grasp the road surface with a bulldog grip.

Then these blocks widen out so they meet at the base. They don't center the strains on a part of the fabric. They distribute the strains

Now, isn't it time that you made a comparison?

Is it wise to face, for another season, blow-outs and rim-cuts and waste?

The evidence is that No-Rim-Cut tires save close to half of one's tire money. Stop and consider what that means to you.

If you question such savings, make mileage tests. And remember that hundreds of thousands have made them, with some two million Goodyear tires.

as with smooth-tread tires. That means a long lived tire.

Five minutes spent in a Goodyear shop will convince you that these things mean less tire cost.

What Mileage?

We can't prophesy the mileage, beyond our warrant, which you'll get from No-Rim-Cut tires.

That depends too largely on things we can't control. It depends on tire size as compared with car weight. It depends on roads and usage.

We can only say how the mileage compares with other tires under the same conditions. And that you can prove by comparison.

Statistics shows that 23 per cent of all clincher tires become rim-cut. Our patent tire never does.

Usage proves that 10 per cent oversize, with equal tires, adds 25 per cent to the tire mileage.

Reason will tell you that double-thick non-skids, with the strains distributed, will outlast the common non-skids.

Now we ask you to learn by odometer test, what all this means to you.

Do It Now

Don't go on paying excessive tire upkeep, if this way really ends it.

Tires should be judged by the cost per mile. Else what is the use of working out these economies?

Here are tires that can't rim-cut. Here are oversize tires. Here are double-thick non-skids. Reason says they ought to save money. Legions say they do. And these tires, on sheer merit, now outsell all others.

You owe yourself a trial of such tires.

Write for the Goodyear Tire Book—14th-year edition. It tells all that we know, after fourteen years, about cutting down tire expense.

GOOD YEAR
AKRON, OHIO.

No-Rim-Cut Tires
With or Without Non-Skid Treads

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO

Branches and Agencies in 103 Principal Cities
More Service Stations Than Any Other Tire

We Make All Kinds of Rubber Tires, Tire Accessories and Repair Outfits
Main Canadian Office, Toronto, Ont.—Canadian Factory, Bowmanville, Ont.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



Don't Let
THIS
Happen To You

"THE BRAKES FAILED TO WORK"

Upon the brakes and *particularly* the brake lining, depends the safety of the car and its occupants. Don't use "cheap," unefficient brake lining. Get the best, get the lining that insures safety. Get—

TRADE MARK
Raybestos
REG. U.S. PAT. OFF.

"THE ORIGINAL AND BEST ASBESTOS BRAKE LINING"

MAKES YOUR CAR SAFE

RAYBESTOS brake lining possesses the highest co-efficient of friction—it "grips," it holds, it prevents accidents. Demand and insist upon getting RAYBESTOS. The name is stamped in every foot of lining to prevent substitution. Ask your dealer. Comes in all widths. Easily attached.

THE ROYAL EQUIPMENT COMPANY

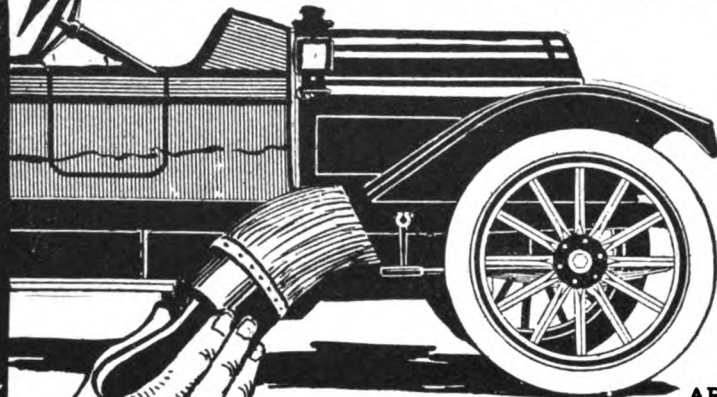
Railroad and Bostwick Aves.

BRIDGEPORT, CONN.

We also make Duplex and Raymond Brakes and Gyrex the Mixer

Raybestos REG. U.S. PAT. OFF.

PAINT YOUR CAR YOURSELF!



SAVE \$25 to \$75

One man in Granite City, Ill., writes after painting his car with the Arsenal System: "My car looks better than many that were painted in St. Louis at six times the cost." (Name on application.)

What he has done you can do
No experience required

MOHAIR TOP DRESSING

ARSENAL MOHAIR TOP DRESSING is the most satisfactory dressing for Mohair on the market. One coat will renew the faded Mohair and stop the leaks. Price, quarts, \$1.50; pints, 80 cents.

ARSENAL BLACK ENAMEL TOP DRESSING is for leather and imitation leather, such as pantasote, etc. Is also a good leather dressing for black upholstery. Price, quarts, \$1.50; pints, 80 cents.

ARSENAL LEATHERNEW is a clear leather dressing for colored upholstery and is a good dressing for colored top if of leather or imitation leather. Price, quarts, \$1.50; pints, 80 cents.

Enamelled Lamps the Style for 1913

ARSENAL LIQUID GUN METAL is the only air-drying brass enamel of **proven merit** on the market. It has **proven its worth** on thousands of cars during the past four years.

Liquid Gun Metal is also made in all the colors of the Arsenal System. Invaluable for enameling the motor, or touching up scratched or marred places when repainting is not necessary.

Arsenal Liquid Gun Metal is for sale by leading dealers everywhere, but if yours does not have it in stock, we will forward a can, express prepaid, on receipt of \$1 (in the U.S. only).

ARSENAL LIQUID SILVER will positively silver-plate brass or copper, quicker and with less labor than any similar material. From two to five minutes is all the time required. It is a satisfactory polish for nickel as well. Price, \$1.00. The popular style is enamelled lamps with silver-plated trimmings. A can of Liquid Gun Metal and a bottle of Liquid Silver enables you to do over your brass in the prevailing style, and we will send both by prepaid express, for \$1.75.

ARSENAL LIQUID RUBBER is a preserving and beautifying tire coating. Liquid Rubber is pure Para gum in solution. Contains so much rubber that it can only be made in natural tire gray. Pints (16 oz.), 55c. Qts., \$1.

ARSENAL BODY POLISH is the utmost in a body polish. After testing it for more than two years we offer it to those exacting motorists who have always been afraid to use a polish. Trial bottle 50 cents.

Our booklet—"The Car Beautiful"—describes these materials in detail, and is the only work of its kind published. Send for it to-day. It is free.

ARSENAL VELVET GLOSS is the new dull finish for motor cars which has come to be so popular for roadsters, torpedo and toy tonneau cars, and is equally good for any car. It is in two coats

with the proper brush for application and will cover solidly over any previous color. Anyone can satisfactorily paint a car with Velvet Gloss by following the simple directions on the cans. Apply a coat to-day, another to-morrow, and use the car the third day. Then, in six months or a year, if your car looks a little shabby, simply give it another coat of Velvet Gloss. You can eliminate your painting bills by using Velvet Gloss.

ARSENAL VELVET GLOSS is made in the following colors: French Gray, Battleship Gray, Ebony Black and Apple Green, and in two sizes of outfits. No. 1, sufficient for cars like the Hupmobile, Ford, etc., costs \$5, and No. 2, for larger cars, costs \$7. Order an outfit to-day and paint your car yourself.

THE ARSENAL SYSTEM of repainting motor cars (for novices) should be used by those desiring a high gloss finish. It is in three coats ready mixed for use, together with proper brushes and full instructions. The Arsenal system is made in the following colors: Red, Maroon, Green, French Gray, Battleship Gray, Orange, Cream, Apple Green, Black, two shades of Blue, and Brown. There are three sizes of outfits: No. 1 for small runabouts, costing \$7; No. 2, for Model T Fords and small touring cars, costing \$8, and No. 3, for large touring cars, costing \$9. If two colors are desired—that is, the body one color and the wheels another—add 75 cents to cost of each outfit. Hundreds of car owners have saved thousands of dollars by doing their own painting with the Arsenal system.

HOOD AND FENDER OUTFITS. A great many cars have the hoods and fenders enamelled black regardless of the body color of the car. We make outfits for this purpose in two coats and one color only, black. No. 1 outfit is \$2.75; No. 2 is \$3.75, and No. 3, \$5.00.

ARSENAL VARNISH CO.,
2501 Fourth Avenue **ROCK ISLAND, ILL.**
Specialists for Motorists

DON'T PAINT YOUR CAR THIS YEAR!

Maybe your car doesn't exactly need painting. Paint is in good shape but it needs something to make it look better. You know if you can put off painting for another year you'll save about \$50 to \$75 and get practically as much if you should sell the car after another season's use.

Six cylinder cars are coming fast—and the second-hand value of a four is decreasing in proportion. In another year you'll be buying sixes at the present price of fours.

You may think it startling that we tell you not to paint your car this year, when we tell you on the opposite page to paint your car yourself. But it isn't. Our business is to help you keep your car looking at its best at the minimum of expense.

Whether your car needs painting or whether it does not is of little consequence to us. We publish an attractive booklet called "The Car Beautiful"—the only thing of its kind published by the way—and the latest edition is just off the press. It contains thirty-six pages of information dealing exclusively with improving the car's appearance and how to do so at home at small expense. If you own a car this booklet is worth a dollar a page to you. We send it free to car owners. If you want a copy please fill in the coupon and mail to us to-day so you won't forget it.

You know a magazine can't treat subjects as fully as we do in "The Car Beautiful," because if they did they would be very liable to offend some advertisers. Unfortunately almost everybody that ever had an idea has tried to sell something to motorists whether it had merit or not. We receive all kinds of letters from motorists who have been "stung," particularly on lamp enamels and silver plating solutions—and one coat black varnish for fenders and hoods.

Now we are going to take you into our confidence. We don't expect to use big space in this paper again before next year. So we earnestly urge you to send for the booklet now. You'll be mighty glad you did.

Just tear off the coupon and mail to us.

ARSENAL VARNISH CO.

2501 Fourth Avenue

ROCK ISLAND, ILL.

Specialists for Motorists

SEND ME YOUR BOOKLET
Name.....
Address.....
City.....
State.....

YOU CAN GET THIS FENDER

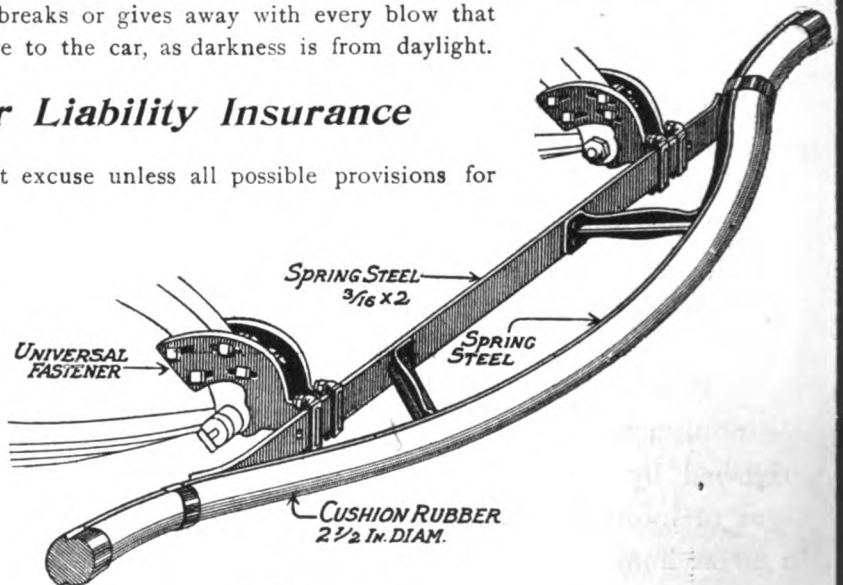
Put This Fender on Your Car for Protection

THE AUTO CUSHION FENDER not only protects the front of your car from damage, but also prevents many serious accidents that would inevitably occur without it. It is as different from the ordinary auto "bumper," which bends, breaks or gives away with every blow that is serious enough to do any real damage to the car, as darkness is from daylight.

Better than Life or Liability Insurance

In the first place the law does not excuse unless all possible provisions for safety have been taken advantage of.

THE AUTO CUSHION FENDER won't bend or break the first time you run into anything. It wards off blows without injury and absorbs the shock by means of the rubber cushion and the spring steel frame.



Auto Cushion Fender Company, 20 West Spring Street
COLUMBUS, OHIO

Please mention the Automobile Dealer and Repairer when writing to advertisers.

FREE IF YOU DEMAND IT

THE AUTO CUSHION FENDER

*The Only Steel Truss Rubber Cushion Fender
in the World.*

It is handsome in appearance, although it is not made for ornament. It is made for the express purpose of protecting your car from damage, as well as many serious accidents to pedestrians.

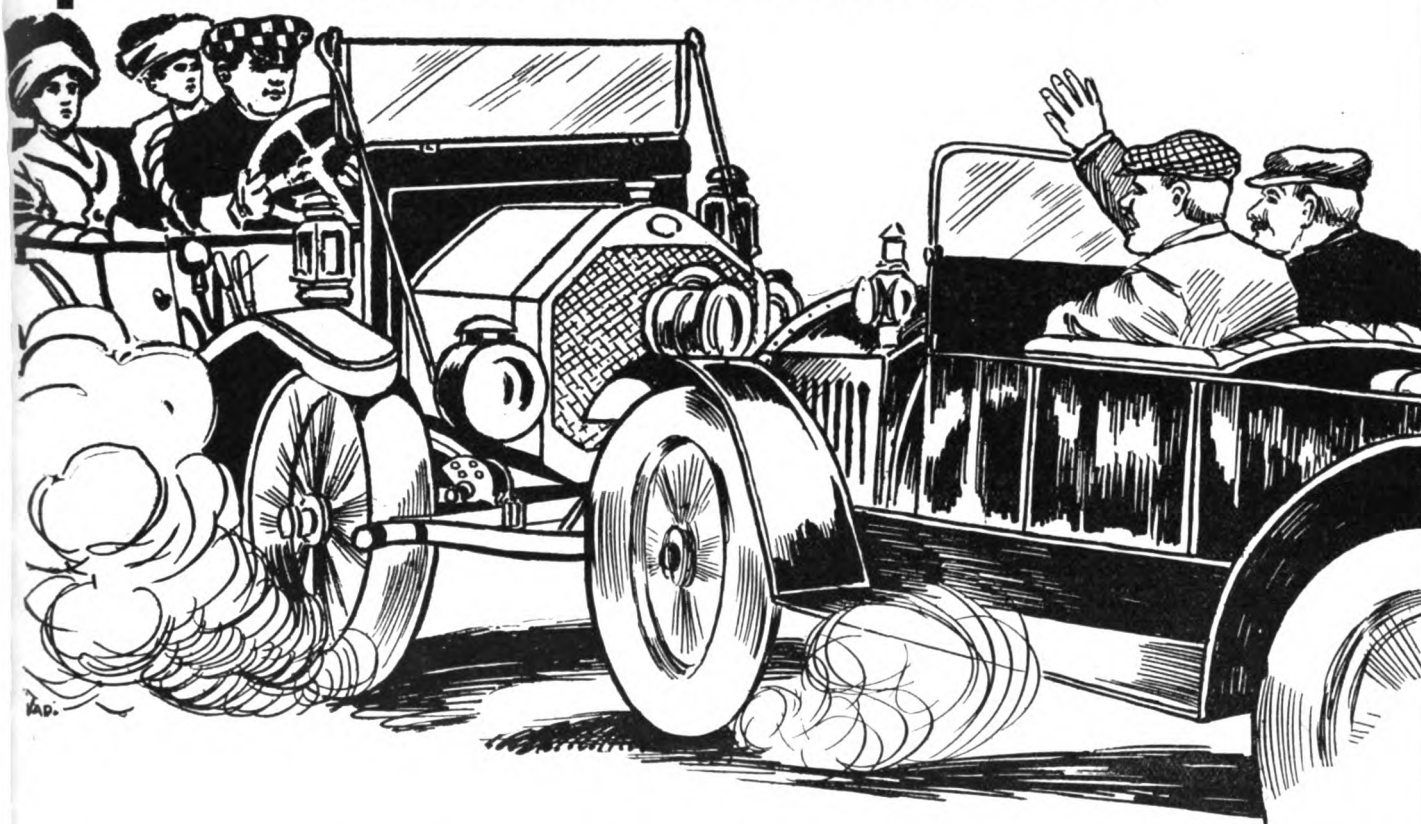
This fender is mechanically correct in design. You don't have to bore holes in the frame and weaken it. Our universal fastener fits any car and holds rigidly without trouble. Quick and easy to install.

Those who have used the Auto Cushion Fender know that it cannot fail.

You can get the Auto Cushion Fender free on your next car, if you demand it. If your dealer cannot supply you write us.

Catalog on request.

DEALERS and AGENTS write for territory.



**Auto Cushion Fender
Company**

20 West Spring Street,

COLUMBUS, OHIO

AUTO CUSHION FENDER COMPANY
20 West Spring St., Columbus, Ohio

Gentlemen:—Please send me full information and
price of your Auto Cushion Fender.

Name.....

Address.....

Please mention the Automobile Dealer and Repairer when writing to advertisers.

The Right Light For Your New Car

Why does gas lighting with an automatic lighter give you just as much convenience and more efficiency, reliability, and economy than any other lighting system? Here are the facts. Keep them in mind in deciding upon any system of automobile lighting.

CONVENIENCE

First of all, you say you want convenience in your lighting system.

Prest-O-Lite, when used in connection with an automatic gas lighter, offers you perfect convenience.

You can use gas in all your lamps, and you can light or extinguish all or any of the lights from the driver's seat, whether your car be moving or standing still. The flow of gas is automatically regulated to produce exactly the proper height of flame at all times. There are several good automatic gas lighters on the market. We make one—the Prest-O-Lite. It is about as simple as an electric door bell. Any of our Service Stations will gladly demonstrate it to you. See it and judge for yourself whether any other system is any more convenient.

Then remember this **distinct advantage**, that should it ever be temporarily disabled, you are not left in the dark. You can light your gas lamps with matches, and **YOU STILL HAVE LIGHT.**

RELIABILITY

Any lighting system on a motor car is subject to the heaviest jolts and shocks. Because of this, and because one must either carry or make his own light, automobile and house lighting are entirely different propositions.

Prest-O-Lite's absolute reliability is unquestioned. There are no delicate adjustments, connections or complicated attachments to get out of order. Prest-O-Lite is so absolutely simple, it is trouble-proof. If, through carelessness, you allow your Prest-O-Lite to run dry, a Prest-O-Lite agency is close by, wherever you may be. Every city and town, and nearly every cross-road village, has its Prest-O-Lite exchange agency.

Here, then, is a system that every dealer understands; that never need leave you stranded on a country road; that never keeps you waiting for a factory expert to come and restore its usefulness; that is not affected by the heaviest downpour of rain.

In short, you have in Prest-O-Lite a system you can absolutely depend upon all of the time.

No matter what self-starter is on your car, your lights should be gas lights. A self-starter is, after all, a highly desirable convenience, but not an actual necessity. Reliable lighting on your car is almost as essential as fuel. The disabling of a self-starter might mean, at the worst, your having to use the starting crank, but an accident to your lighting system may leave you helpless in the dark. But so long as you have Prest-O-Lite and matches, you have light. Almost any manufacturer will equip your new car with Prest-O-Lite and an automatic gas lighter, if you insist. If your car is now equipped with Prest-O-Lite, any of our Service Stations or any dealer can install an automatic lighter at small expense.

Before you decide on any gas lighting system, post yourself thoroughly by sending for a free booklet, "Light on the Lighting Problem," reprinted by permission, which gives all the facts on lighting prepared by one of the foremost authorities. By sending coupon below, it will reach you without charge by return mail.

THE PREST-O-LITE COMPANY

251 E. South Street, Indianapolis, Ind.

Please send free booklet, "Light on the Lighting Problem," to

Name

Address

EFFICIENCY

Exhaustive experiments have proven that the naked light of a 3/4-foot acetylene burner gives 30 candle power without a reflector. The average naked light in other systems is 20 candle power or less. Weaker lights than Prest-O-Lite can give a blinding effect by the use of parabolic reflectors.

This principle was first employed in gas lamps, but was discarded as unsatisfactory, because while this type of reflector threw brilliant, concentrated rays far ahead it did not give the light down on the ground 10 to 50 feet ahead of the car, where you need it most, to give a perfect view of the road itself. Every experienced driver will tell you that Prest-O-Lite, with the reflectors now used in the gas lamps, gives all the light needed far ahead, and in addition gives a light immediately in front of the car which affords the driver a better idea of the ruts and bumps than he can get even in broad sunlight. This effect cannot be had from any lamps using parabolic reflectors.

Prest-O-Lite, as a practical road light for the driver, has no equal.

ECONOMY

There is no other efficient lighting system that costs less to operate and maintain than Prest-O-Lite. The average cost of Prest-O-Lite operation among over five hundred thousand actual users is less than \$10 per year. The user has no expense for repairs, for renewal of worn-out parts or for adjustments, and its operation consumes no power and in no way interferes with the full efficiency of your engine.

Just one repair bill on any complicated, delicate lighting system might easily cost more than years of Prest-O-Lite service.

But even if Prest-O-Lite operation costs more than other lighting systems—instead of less—its reliability, its efficiency, its freedom from annoying troubles, should make it twice as valuable to any experienced driver.

The Prest-O-Lite Company, 251 East South Street, INDIANAPOLIS, IND. Canadian Factory and General Office, MERRITTON, ONT.

BRANCH STORES AND SERVICE STATIONS IN THESE CITIES: Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Indianapolis, Jacksonville, Kansas City, Los Angeles, Memphis, Tenn., Milwaukee, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Ore., Providence, St. Louis, St. Paul, Minn., San Antonio, San Francisco, Seattle, Syracuse, SERVICE STATIONS IN CANADA: Merritton, Ontario; Toronto, Ontario; Winnipeg, Manitoba.

Exchange Agencies Everywhere.

Insist on Gas Lighting

Please mention the Automobile Dealer and Repairer when writing to advertisers.

The Right Light For The Dealer

You Can Cash In On This Campaign

More than 10,000,000 readers will see Prest-O-Lite advertisements along the lines of the one on the opposite page. Among these readers are **your** patrons and **prospects**.

You'll want to read these advertisements carefully. Be prepared to reap what we are sowing.

How To Do It

You are familiar with the Prest-O-Lite Gas Tank Proposition—what it means to you as a dealer, and what it means to the hundreds of thousands users of Prest-O-Lite.

You should be equally familiar with the Prest-O-Liter. It is the final touch that adds unexcelled convenience to an efficiency and reliability that has never been questioned.

Consider the field open to you, the number of cars equipped with gas, to say nothing of the new cars every day. All these are your prospects.

The Prest-O-Liter

is a simple, efficient, automatic lighter for gas lamps that you ought to know about. It consists of the car's ignition battery or a few dry cells, a coil, wires to the lamps, an automatic reducing valve and a control valve and a push button on the dash. Turn the valve, push the button and the lamps are lit.

The Prest-O-Liter is easily and quickly installed and gives the user every convenience of the most complicated and expensive system, with greater reliability and economy in upkeep.

The Prest-O-Lite Company, 251 East South Street, INDIANAPOLIS, IND.
Canadian Factory and General Office, MERRITTON, ONT.

BRANCH STORES AND SERVICE STATIONS IN THESE CITIES: Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Indianapolis, Jacksonville, Kansas City, Los Angeles, Memphis, Tenn., Milwaukee, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Ore., Providence, St. Louis, St. Paul, Minn., San Antonio, San Francisco, Seattle, Syracuse, SERVICE STATIONS IN CANADA: Merritton, Ontario; Toronto, Ontario; Winnipeg, Manitoba.

Exchange Agencies Everywhere.

Send for Details

Every dealer should know about the Prest-O-Lite Campaign for *reliable automatic lighting*.

You'll want to be able to demonstrate and install the Prest-O-Liter, when the calls come.

We're ready to help you in every way and furnish literature for you to distribute. Use the coupon below, get in touch with the movement and be prepared to get your share when business comes your way.

PREST-O-LITE COMPANY

251 E. South Street, Indianapolis, Ind.

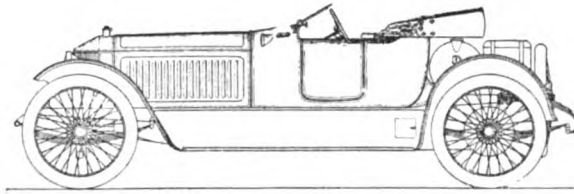
Kindly send full particulars on Prest-O-Lite and keep me in touch with your "Insist on Gas Lighting" Campaign.

Name.....

Address.....

Insist on Gas Lighting

Please mention the Automobile Dealer and Repairer when writing to advertisers.



DOBLE STEAM CAR

SILENCE—SPEED—SIMPLICITY

ABNER DOBLE CO.

WALTHAM, MASS.

Head Light Glare Remover

ATTACHED TO THE WIND SHIELD

PAT. APPLIED FOR

MAKES NIGHT DRIVING SAFE



Clear Vision Ahead



Removing Glare of Approaching Head Light

By moving the head so that the approaching headlights are seen through the amber colored glass, the blinding glare is removed, the view of the road and the approaching car is unobstructed, and the danger to passengers and the public is avoided. At all times, there is a clear vision ahead. This device can be attached to any windshield, having round tube, square frame, or plain glass edge. It is adjustable for height and position to suit any driver. If not carried by your dealer, prepaid in U. S. on receipt of \$2.00.

WM. L. TOBEY, 12 Lewis St., East Boston, Mass.

Q. D. Rim Remover

PATENTED AUG. 27, 1912.

**SAVES TIME, LABOR, TROUBLE
WHEN CHANGING TIRES**



Hook the tool over the outer edge of tire rim, between the two ends of locking ring. Push valve stem into rim so that locking lug clears inside of Shoe. Screw the bead ring off locking ring. It holds the rings apart, leaving both hands free to remove the locking ring. Nickled and case hardened, it weighs 2½ oz. If not carried by your dealer, mailed prepaid in the U. S. on receipt of 65c P. O. or EXPRESS MONEY ORDER, or 75c on check requiring collection charge.

Buy direct from **BONAFIDE MANUFACTURERS**

MATTSON RUBBER CO., LODI, (Bergen Co.,) N. J.

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Prest-O-Starter

Starts your engine (old or new) quickly and easily in coldest weather

FOR FOUR CYLINDERS, \$20
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\$1.50 extra for two-way valve necessary when the same Prest-O-Lite is used for both starting and stopping.

Here's a starter that adds practically no weight to your car, is perfectly simple and is as durable as the engine itself. Easily applied to any engine, old or new, very economical in the use of gas, and requires no expert repairing.

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The principle of starting a motor with Prest-O-Starter is the same as "starting on compression." A measure of acetylene, at low pressure, is pumped from your Prest-O-Lite into the cylinders.

Touch your spark—your engine starts.

Unlike "gasoline priming" it is not affected by heat or cold. It is certain.

In cool weather, by opening a valve on the dash, you can feed gas at low pressure into the intake manifold. This allows your engine to run on acetylene until it is warm enough to run on gasoline.

If the Prest-O-Starter did no more than prime your engine in this way during cold weather, this convenience would be well worth the price.

But Prest-O-Starter is more than a primer. When installed properly, it will start your engine, summer or winter, almost invariably without recourse to the crank.

Make Sure Your Starter is Installed CORRECTLY. Look it over!

The Prest-O-Starter is easy to install correctly. In fact, it's so very easy to install that some good factories and

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Our literature tells you exactly how the Prest-O-Starter is installed, and how to adjust it. Anyone can give it the slight attention it may need or quickly tell a dealer where the trouble lies.

Every Prest-O-Starter is sold with the assurance of satisfactory service. The entire Prest-O-Lite Organization is back of every one. If you have any trouble, report it to us or to our nearest branch. We'll wipe it out quickly.

Insist Upon GETTING the Outfit COMPLETE

During warm weather the connection which feeds acetylene into the intake manifold is not needed. So some dealers are not installing it. But in cold weather this feature is vital. You're entitled to it. It's included in the price, so see that you get it.

Now More Than Ever You Need One

Your Prest-O-Starter, properly installed, will average better than 95 starts out of 100 attempts. The few failures are caused by your motor stopping on dead center, or cylinders filled with burnt gas. Both of these conditions can be easily avoided when stopping your motor. But should either or both happen, an eighth or quarter turn of the crank, with the switch at neutral, will remedy the trouble at once, with all of the danger and labor of cranking eliminated.

Rest assured that no other starter can give you as high efficiency with as great economy, durability and freedom from mechanical trouble. The price is within easy reach.

Get in touch with any of our branches—or your dealer—or write us for descriptive literature.

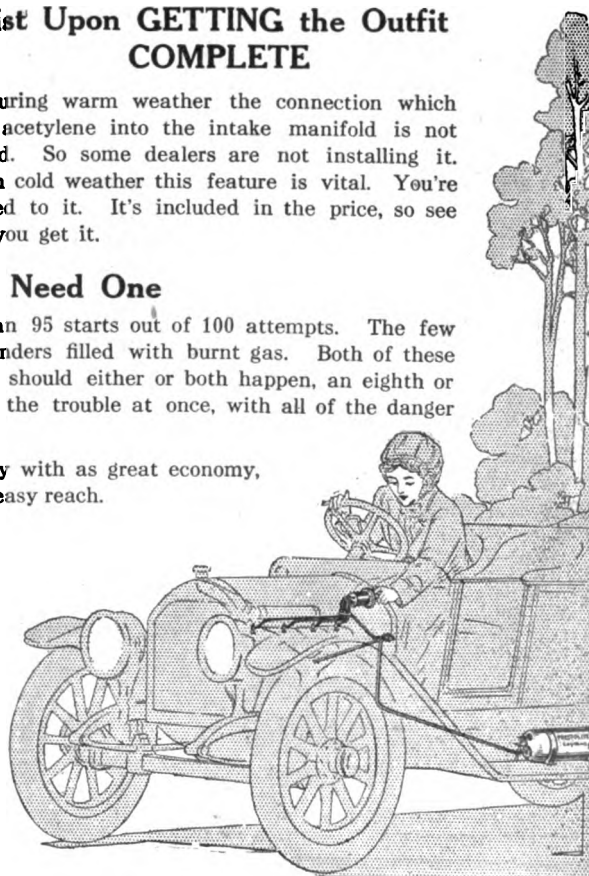
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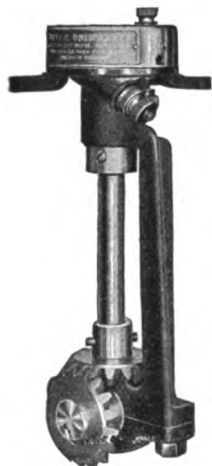


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The Atwater Kent Ignition System



Magneto Gear Mounting for installing the Atwater Kent System in place of magneto.



For 2-Cylinder Maxwell Cars Prior to 1909 Models.



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For Ford Models N, R and S.

has been on the market for the past seven years, during which time over seventy-five thousand have been used with universal satisfaction and the demand is steadily growing among discriminating car owners who require the best ignition obtainable.

The Atwater Kent System embodies the best features of both magneto and battery—in fact, it gives magneto results with a battery system without the weaknesses of either, at less than one-half the cost of a good magneto.

The Atwater Kent System can be easily installed on any standard make of motor, new or old, by substituting the Unisparker for the regular timer on the timer shaft of the engine. To meet a large demand for its use on cars where it is impossible to place the Unisparker directly on the timer shaft, such as the various model Fords, Franklins, 2-cylinder Buicks and Maxwells, we have designed special gears and brackets which enable the installation to be easily and quickly made with little or no machine work. During the past season we have furnished several thousand of these equipments, enabling the owners of the above cars to have an ignition system equal to that found in the highest-priced car.

Due to the steadily increasing demand for the Atwater Kent Ignition System we have increased our manufacturing facilities, enabling us to manufacture this equipment in such quantities that the cost of efficient factory operation can be reduced to the minimum, and we herewith announce to the trade and the motoring public the following reductions in price of our Type F system.

Prices of the Type F Atwater Kent Ignition System

	Standard Coil Box	Kick Switch Coil Box
1-cylinder.....	\$17.00	.....
2-cylinder opposed.....	18.00	.....
2-cylinder distributor type.....	22.00	\$24.00
3-cylinder.....	25.00	27.00
4-cylinder.....	25.00	27.00
6-cylinder.....	27.00	29.00

The price of the different gear sets illustrated herewith is \$3.00 each in addition to the above prices.

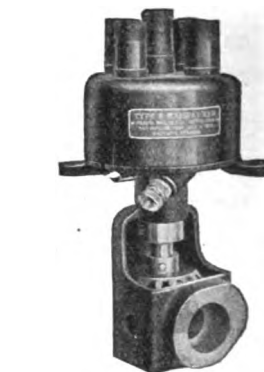
In substituting the Atwater Kent System for the magneto, a special magneto gear mounting is required, illustrated herewith, the price of which is \$5.00 in addition to the above prices.

When you install the Atwater Kent, you do not need an expert and will not have to worry about your ignition. You can be sure it will get out of your motor all the speed and flexibility the maker put into it and that it will last as long as the motor.

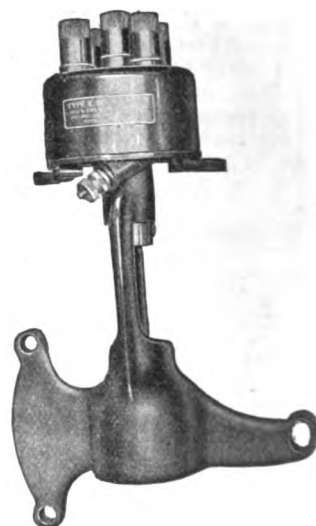
Perhaps your present car only needs an Atwater Kent Ignition System to enable it to give you perfect service—anyhow you should have a copy of our booklet "G," full of ignition facts—it's interesting and it's free.

ATWATER KENT MFG. WORKS

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For Ford Cars, Model T, also 1911, 1912 and 1913.

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Fort Washington, Pa., December 3rd, 1912.

Gentlemen:—I have had your improved M & M Economizer installed on my car, which is a FORD, for a period of two months. I have therefore been able to test it well, and I have received surprisingly good results. I find that I have been able to save 40% of my gasoline consumption, as you have claimed. With my throttle set at fifteen miles per hour, I have been able to increase my mileage to twenty-two miles, with the same amount of gasoline. I have connected this device up to my throttle for speeding, and I use the friction foot pedal for coasting.

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Yours very truly,
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WITH Economy and Safety

The M & M Economizer is a nickel plated device, highly polished. It is inserted into the manifold. It is made with one valve and six portholes, for SPEED and POWER, and cutting out all gasoline and ignition while descending grades, slowing up for crossings, and turning corners. WHAT THE COASTER BRAKE IS TO THE BICYCLE, The M & M is to the AUTOMOBILE. When descending grades the M & M acts as an air brake.

THERE IS NO SCREEN PLACED INSIDE OF MANIFOLD IN CONNECTION WITH THE M & M

Where a screen is used inside of manifold, it will clog it up and make it harder for the motor to absorb the gas and air coming from the carburetor. IT STANDS TO REASON, that when a screen is placed in the manifold, it will decrease the capacity of the pipe, and it is easy to understand that the motor can absorb gas and air better through a large passage than it can through a small passage. When your car is equipped with the M & M, your manifold is clear from all obstructions, and the motor can easily and swiftly absorb the gas and air into the cylinders. WHY DO THE MANUFACTURERS TO-DAY INCREASE THE SIZE OF THE VALVES AND MANIFOLD? Simply to obtain Speed and Power. Ask your mechanic, and he will verify our statement.

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The M & M is the only known Do not throw your old carburetor device. THEN NOTICE RESULTS. automobile or motorcycle on the The automobile attachment requires fold, and the motorcycle size requires a 1/4" pipe tap. Operated by friction control.

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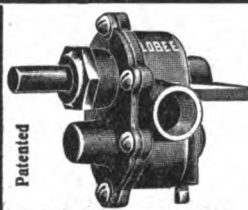
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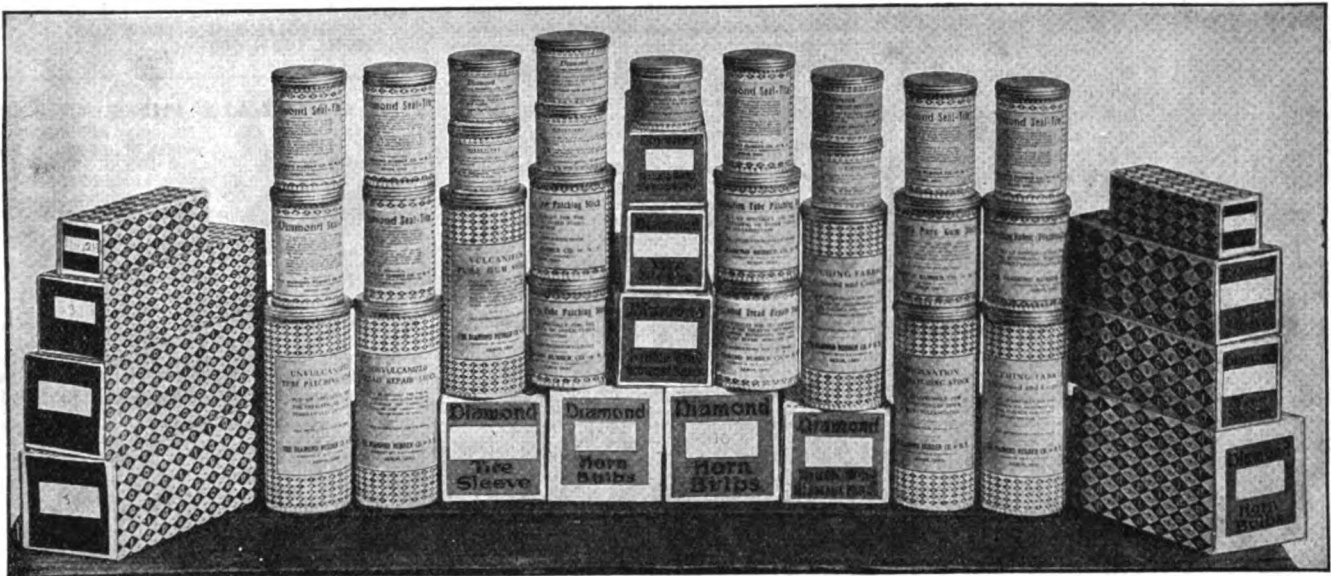
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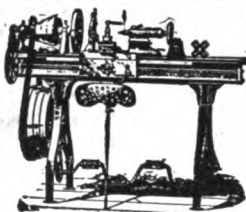
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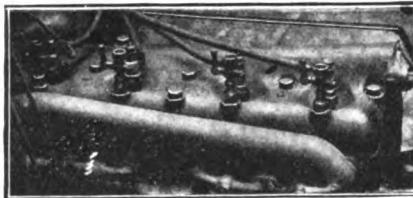
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System, Stand and Portable hanging lamps—anybody can use or sell them and make good money—why can't you?

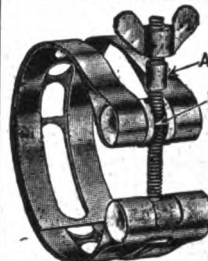
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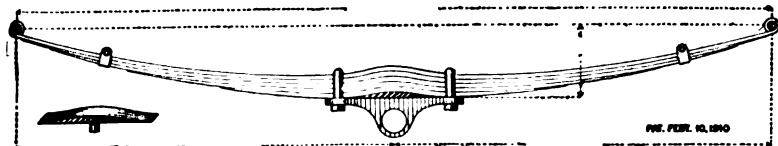
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strengthens tires and prevents punctures and blowouts, gives honest, reasonable service.

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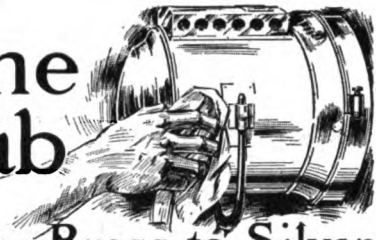
For 2 cents you, yourself, can **permanently** repair every puncture or blowout in tube, or cut in casing. Easier, quicker and better than vulcanizing. Costs one-tenth as much. No heat or tools needed. Nothing but your two hands and



Use the Tire-Doh Outfit anywhere—in the shop or on the road. Cut your tire repair expenses down to almost nothing. Tire-Doh means freedom from big tire repair bills and annoying delays. Double the life of your casings by promptly repairing cuts and blisters with Tire-Doh. The Outfit comes only in white enameled can as shown above, and consists of one can of Tire-Doh, and one can of Tire-Doh Cement. Neither Tire-Doh nor Tire-Doh Cement is ever sold separately or under any other label. Price now \$1. Just as much Tire-Doh and Tire-Doh Cement as in the old \$2 Outfit. Ask your dealer for a Tire Doh Outfit to-day. Or send us \$1 for a Tire-Doh Outfit express prepaid. You run no risk. Money back if not satisfied. But insist upon genuine Tire-Doh if you want our money-back guarantee.

ATLAS AUTO SUPPLY CO., 3247 W. Lake St., Chicago

One Rub Turns Brass to Silver



Talk about your nickel plated lamps! In a few minutes you can **silver** plate every piece of bothersome brass or copper on your car. All you need is a piece of cheese-cloth and a bottle of

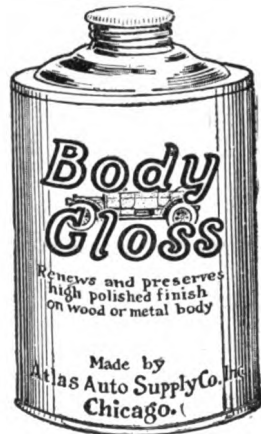


Get away from that cheap brass work on anycar—lamps and all. Resilver reflectors. Look up-to-date. Use Silver-Quick and say good-bye to polishing forever. When long exposure has made the first coat dull, just use Silver-Quick again. It's easier than polishing. Silver-Quick is not mercury or quicksilver. It gives a genuine silver plate. \$1 bottle will silver plate all

brass work on anycar—lamps and all. Resilver reflectors. Renew nickel plate. Make a note now to ask your dealer for a bottle of Silver-Quick or send us \$1 now. You run no risk. We absolutely guarantee Silver-Quick to be and do everything we claim for it. We will give you your money back if not satisfied.

ATLAS AUTO SUPPLY CO., 3247 W. Lake St., Chicago

Keep Your Car Looking Like New



Preserve the beautiful lustre and finish of your car. Use BODY-GLOSS. An hour's easy work once a month keeps a car shining and new looking. A wonderful varnish renewer. The only perfect refinisher. Easy to apply. Simply pour on cloth and rub on. Finish with dry cloth. Economical. A pint goes over any touring car twice. BODY-GLOSS will not restore the factory finish to a body that needs painting. But its use will preserve for an indefinite period the lustre of a well finished car. Use BODY-GLOSS and your new car will always look new. At your dealer's. Insist on BODY-GLOSS if you want our money back guarantee. Pint can 75 cents; Quart can. \$1.25.

ATLAS AUTO SUPPLY CO.
3247 W. Lake St., Chicago

FREE

This coupon good for a sample can of Body-Gloss. Only one to each person. Present coupon at your dealer's.

Dealer's Name.....
Address.....
Name.....
Address.....
Atlas Auto Supply Co., Chicago.

Save Your Tires



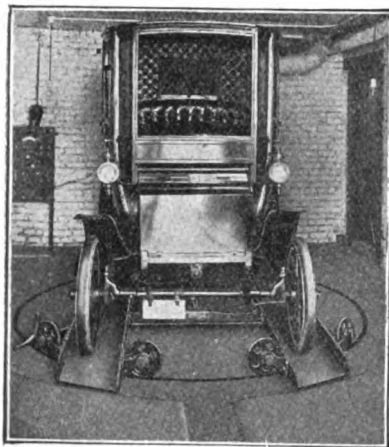
Preserve your tires. Increase tire mileage. Make your tires look bright, white and new. Coat them with Preserv-O Tire Paint. Penetrates into every cut and crevice of the casing, leaving the tire coated with a new, perfectly waterproof surface. Preserv-O Tire Paint dries in 15 minutes and then cannot rub off. Cannot harm tires. Contains nothing not actually used in making the tires themselves. Economy, as well as pride in the appearance of your car, dictates the use of Preserv-O Tire Paint. This is the best tire paint on the market. A trial will prove it. Pint can, enough to coat six big tires, 50 cents. Get a can to-day of your dealer. You run no risk. Money back if not satisfied.

ATLAS AUTO SUPPLY CO.
3247 W. Lake St., Chicago

FREE

This coupon good for a sample can of Preserv-O Tire Paint. Only one to each person. Present coupon at your dealer's.

Dealer's Name.....
Address.....
Name.....
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Atlas Auto Supply Co., Chicago.



PITLESS Auto Turntable

Easily Installed

Made entirely of steel; equipped with ball bearings throughout.

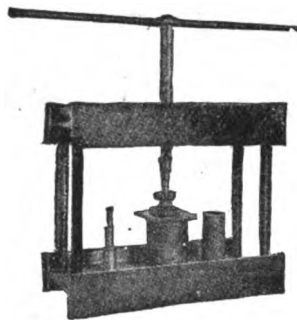
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POST'S ARBOR and GEAR PRESS FOR GARAGES AND REPAIR SHOPS



For forcing bushings, removing or replacing gears or straightening shafts, it is the best machine made.

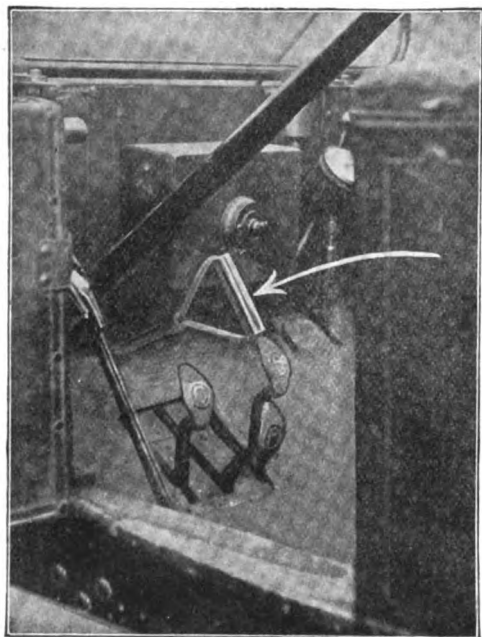
Will pay for itself in a short time in any garage or automobile repair shop.

Durable, strong, reliable. Will not break or wear out.

Write for prices and particulars to

AMOS POST, Church St., CATSKILL, N. Y.

THE TRIPLEX STARTER For FORD Engines



"It is out of sight," under the hood. All that shows is a small hand lever on dash. You do not have to leave your seat to start your Ford Motor when equipped with the **TRIPLEX STARTER**.

All that is necessary is to pull the lever. Will positively turn your motor over every time.

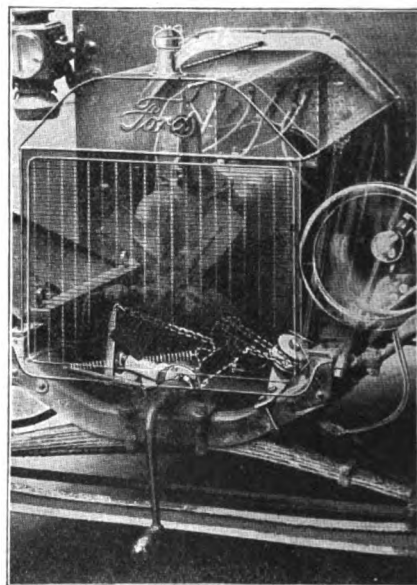
The **TRIPLEX FORD ENGINE STARTER** is a mechanical starter, which, of all types—compressed air, acetylene gas, electric and spring—is the only one on the market which at all times proves absolutely **RELIABLE**. In no respect is it a "Hit-or-Miss" proposition—working one minute and short-circuiting or blowing out a cylinder head the next. It gives 100% uninterrupted service from the time it is attached. It comprises so few parts and is so simple and direct in application that it cannot get out of order, and it is as safe and durable as it is simple and effective.

With the **TRIPLEX STARTER** you have two starting devices. You do not remove the crank. It stays on.

"Ask the man that has one."

To be had at all dealers or direct on receipt of price.

DEALERS.—It doesn't require SALESMANSHIP to sell an **ARTICLE** for which every **FORD OWNER** is clamoring. Bring the **TRIPLEX FORD ENGINE STARTER** and the **FORD OWNER** together and safe results. Big sales spell Big Profits. Get our Sales Proposition today. Write or Wire. No more broken arms. Back kicks are dangerous.



PRICE \$11.50

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Western Representatives, **AUSTERMELL and HANSON**, 560 Phelan Bldg., San Francisco, Cal.

Write Department 10

"JOIN THE JOLLY AMERICAN INDIANS"

The Hit of the New York Auto Show

Come and sit in the Chair of Honor and sign the Register with the other live wires.

Meet me at the Boston Auto Show

The American Tire and Rubber Company
AKRON, OHIO

Manufacturers of

AMERICAN INDIAN REINFORCED INNER TUBES, TIRE ACCESSORIES—SOLID TIRES—5 MINUTE CURE VULCANIZING CEMENT.

Tire Resistance to Decay

can be increased at least 30 per cent. by the use of Tirenex and Narco Tire Cut Filler.

TIRENEW

is a liquid, unvulcanized, rubber compound—waterproofs and protects the inner fabric from decay.

Makes Tires Look Like New

Narco

TIRE CUT FILLER

a self-vulcanizing, combination rubber cement, cut filler and mastic. Fills cuts and puncture holes—heals over night—becomes like part of the tire. \$1.00 a tube.

Dealers—Car Owners.

Send \$1.00 for a trial can of Tirenex—contains enough for 10 tires.

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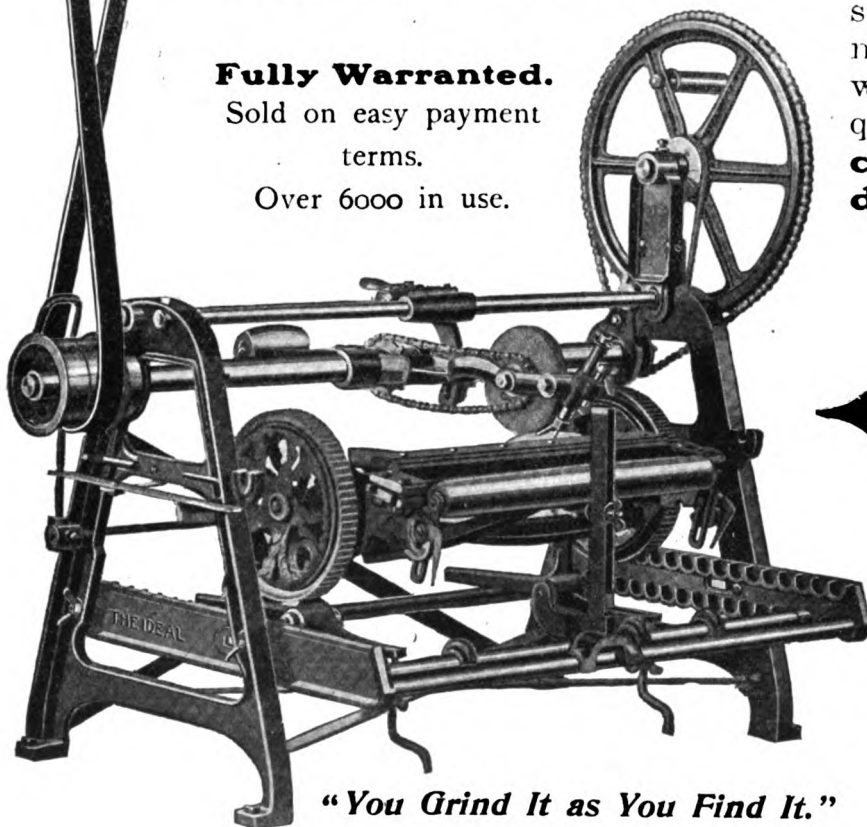
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Lawn Mower Grinder

Grinds all makes of mowers perfectly in 15 minutes, without removing wheels, ratchets or reel-knife. Will also grind straight-blade without removing from mower. Has Skate Sharpener Attachment for sharpening skates. The only practical machine for sharpening Lawn Mowers on the market. Operated by either hand or power. Ball-Bearing Alundum Grinding Wheel and Main Shaft.

Write Today for full information of this great labor-saver and money-maker. Will do the work so much better, quicker and easier, you **cannot afford to do without it.**

Fully Warranted.
Sold on easy payment terms.
Over 6000 in use.



**Write today.
Don't delay.**

**THE HEATH
FOUNDRY
& MFG. CO.
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OHIO**

"You Grind It as You Find It."

FORE-DOORS.

Bring your open-front car up-to-date. We make fore-doors to fit all standard makes of automobiles.

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ELECTRICK VULCANIZERS

Cut down tire bills one-half, and more. A postal will bring to you an illustrated booklet telling how. Send for it now.

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TWO CYCLE ENGINES!

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Swinehart TIRES

PORTER'S BOLT CLIPPERS

"Easy" "New Easy" Allen-Randall



To cut 5-16, 3-8, 1-2, 5-8, 3-4 inch.
H. K. PORTER, EVERETT, MASS.



**MODERN
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Chatham, N. Y.

A helical spring made of oil tempered steel wire, attached as illustrated, makes any car easier to control and helps prevent accidents, you should have one, ask your dealer or write for full information.

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of bigger sales, new customers and more money. Representative dealers everywhere have learned that Essex Quality counts, and the new 1913 Essex Auto Accessory Booklet will show you how to build up a bigger, better and far more profitable accessory business.

Write for it TODAY.

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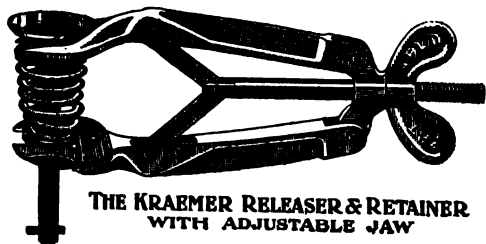
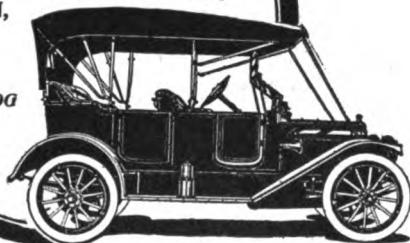
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Get Our 1913 Agency Proposition.
WRITE US THIS MINUTE
It's all Velvet for the Agent.

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CATALOG
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**THE KRAEMER RELEASER & RETAINER
WITH ADJUSTABLE JAW**

We teach you how.

Ask your dealer for THE KRAEMER Valve Spring Releaser and Retainer with Adjustable Jaw; if they haven't got them accept no other.

Every tool guaranteed to give satisfaction or money refunded. Prepaid to any address on receipt of Express or P. O. Money Order for \$3.00.

Discount to dealers. Mention Automobile Dealer and Repairer.

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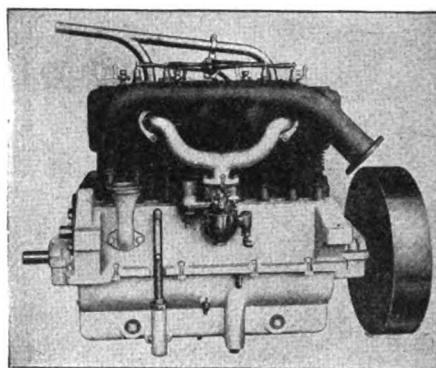
With this tool and our simple, practical instructions for grinding in engine valves which are gratis with each tool, any one can do the work. All Automobile users know the necessity of having engine valves ground to a perfect seat, to get the most efficiency from their motor.

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IN writing to advertisers for circulars or information, you are earnestly requested to mention in each case that the advertisement was seen in the "Automobile Dealer and Repairer." By so doing you will confer a favor on both publisher and advertiser

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4½ Inch Bore, 4½ Inch Stroke, 35 H.P.



Guaranteed - Motor only - \$140.00

Motor with carburetor and Splittorf magneto with coil.....\$165.00

This is a special price to introduce these motors and only a few of them will be sold at this price.

AUTO PARTS CO.

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CADILLAC PUMP

This pump made especially for 1913 Cadillac Cars. Metal Pistons with Cast Iron Piston Rings on each. Drop Forged Crank. Aluminum case. Built like a Motor. Anyone can attach it.

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TROY, N. Y.

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Are you handling your automobile repairing to your employer's satisfaction?

Do you desire to improve yourself?

If so, write for circular on our new Correspondence Instruction Course in Automobile Repair Shop Practice.

A non-technical course for the shop man.

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By Victor W. Page, M. E.

Over 700 (6x9 in.) pages. Ten large folding plates.

500 Illustrations. **Price \$2.50.**

The latest and most complete treatise on the Gasoline Automobile ever issued.

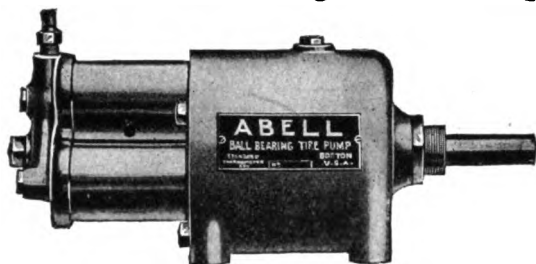
The book tells you just what to do how and when to do it. Nothing has been omitted, no detail has been slighted. Every part of the automobile, its equipment, accessories, tools, supplies, spare parts necessary, etc., have been discussed comprehensively. If you are or intend to become a motorist, or are in any way interested in the modern Gasoline Automobile, this is a book you cannot afford to be without. This work has been highly endorsed by Automobile Manufacturers, Designers and the Technical Press. For Sale By



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Cast Iron Cylinders and Pistons.
Drop Forged Connecting Rods.
Three Cylinders.
Every Revolving Part is Ball Bearing.
Speedy—Durable.

Attachable to your car for inflating tires. Fittings for all the leading cars, complete, \$30. Portable electric garage pumps, \$80 to \$85.

Air Starters.

STANDARD SPEEDOMETERS

1913 Models

The Speedometer with an unbreakable flexible tubing. Pivot joint with nickel steel gears. New extra strong flexible shaft.

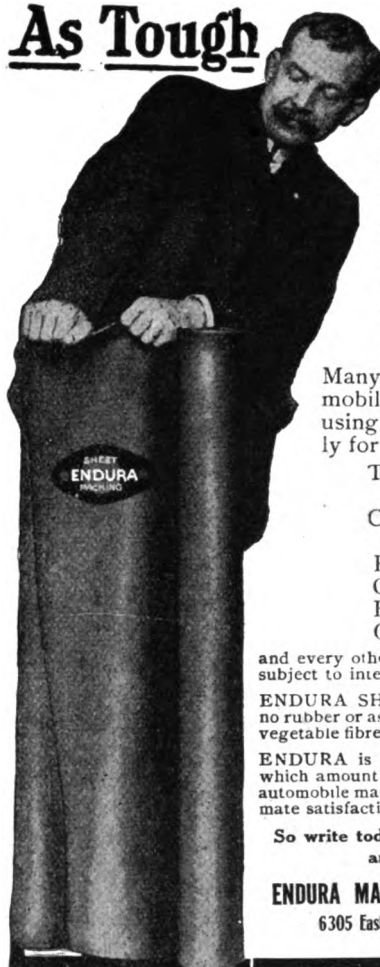
A rotating hand type of Speedometer. Speed is read at a glance, which cannot be said of the revolving cylinder type.

Catalogues of Pumps and Speedometers on request.

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Here's a packing that will not only save you money on the first cost, but also will not soften or rot under any of the conditions that destroy the best of other sheet packings.

Many of the largest automobile manufacturers are using ENDURA constantly for

Transmission cover gaskets
Crank case cover gaskets.
Pumps
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and every other purpose where it is not subject to intense dry heat.

ENDURA SHEET PACKING contains no rubber or asbestos, but is made from a vegetable fibre chemically treated.

ENDURA is one of those small things which amount to such big things to the automobile manufacturer in increased ultimate satisfaction to his customers.

So write today for free trial sample and full details.

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TRADE MARK—REG. U.S. PAT. OFF.

OILS

Give Real Lubrication

Practically no soot-deposit forming ingredients—no injurious substances—no waste—best Pennsylvania crude—greatest care in manufacture. These are the reasons why HARRIS OILS give real lubrication, a smooth, sweet running motor—no flagrant smoking—economy—and highest engine efficiency.

Be sure to see our exhibit at the Boston Show, Space 510, Dept. F.

A little goes a long way and every drop counts.



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DO YOU CUSS, WHEN IT RAINS, BECAUSE YOUR AUTO TOP LEAKS?

You Can Laugh at the Rain If You Use

3-W WATERPROOFER

You will smile and be pleased with that new silky appearance that 3-W WATERPROOFER gives to your top. For leather, mohair, pantasote, duck or rubber. Excellent for seats and dust shields. Easily applied; dries instantly. Does not crack, catch or hold dust. All colors. Only one coat necessary. One can covers 50 square feet.

\$5.00 per Gallon. \$2.50 per Quart.

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Cracked or Broken

Cylinders, Crank Shafts,
Crank Cases, Housings, Frames,
Axes, any metals of any shapes or
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absolutely
GUARANTEED

Write for estimates.

Complete Oxy-acetylene Welding and Cutting Plants Installed.

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SPLITDORF
"Always There"Non-vibrating "TS" SPLITDORF
COIL is equally effective with all the
newer as well as older models of the famous
SPLITDORF low-tension system.

Write for new catalog

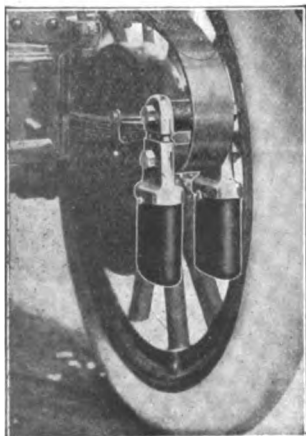
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The Test of Merit

The following well-known cars exhibited at the New York Pleasure
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test in competition with other makes, and won out on
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make the gas pleasure car efficient, reliable and convenient.

Type 1F Ammeter

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Penacook, N. H.**IMPROVED VELVET SHOCK
ABSORBING SPRINGS**See us at Chicago Auto Show in
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shackles and compel your car to ride
easily over roughest roads and cobbles-
stones.They save your tires and the entire
car.Can be attached in a few moments
and require no fittings nor boring in
the frame of the car.

A few agencies still open. Write us.

JOHN W. BLACKLEDGE MFG. CO.
2210 Michigan Ave. Chicago**"The Chain That Lasts"****"BEST" TRACTION
CHAINS**Still putting out the same
quality.Glad to tell you "Why"
"they last."**H. E. McLain and Co.**
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Indicates the Level of Oil in Crank Case

A very useful device. Will save its cost in oil in a short time.

Attach in place of lower pet-cock on crank case.

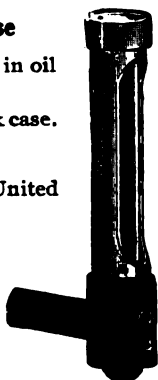
Price, 75c.

Will be sent by prepaid mail anywhere in United States or Canada on receipt of price.

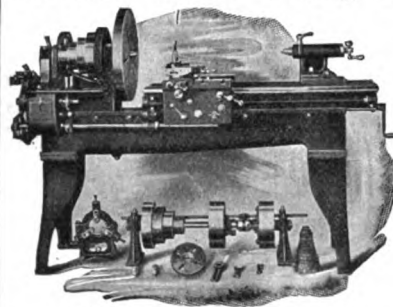
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E. EDELMANN & CO.

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Our New 14-24" Sliding Extension Gap Lathe



Write for Latest Bulletin and Attractive Prices.

Barnes Drill Co., Inc., 1907,

Builders of the All Geared Drill.

This Lathe swings 14 1/2 in. over top bed, 24 in. through gap, and the gap opens 18 in. and 36 in. wide.

Has 2-15/16 in. spindle with 1-9/16 in. hole thru same. Six quick changes of Geared Feeds, four Step Cone of large diameters.

The 5 1/2 ft. bed takes up to 54 in. between centers, while our 7 1/2 ft. machine takes 96 in. between centers when extended.

Just the thing for garage and repair work, and saves investing in a large expensive lathe.

Machine is built strong, rigid and accurate, and can be furnished with taper attachment.

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Gasoline Bills Reduced 25% with MONDEX-HELIX



Increases power on hills and everywhere at all speeds up to 50% on low speed. Everywhere on high gear. Greater flexibility. Silent motor. Smooth pull. Anybody can attach. No moving parts. Never needs attention.

Sizes for any Carburetor will be sent by express, C.O.D. or mail, with full instructions on receipt of price. 1 inch to 1 1/2 inches, \$3; 1 1/2 inches to 2 inches, \$4.

AGENTS WANTED

ARISTOS COMPANY, 250 West 54th ST., NEW YORK, N. Y.

MONDEX SHOCK PREVENTERS

They have proved in less than one year that they are right—proved their case absolutely in the highest court of mechanical test known to the Automobile Engineering World—MOTOR CAR RACING.

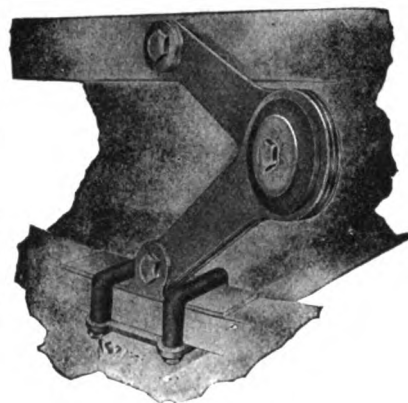
They won the VANDERBILT CUP for Mulford and the GRAND PRIZE for Bruce-Brown

The real reason, however, is the correctness of their mechanical principle and perfectness of construction.

The Mondex Shock Preventer is a device that is attached to the sides of the springs, between the axle and the frame of the car, and controls the action of the spring as it moves up and down.

They cost no more than any other—ask us more about them

ARISTOS COMPANY, 250 West 54th St., New York, N. Y.



AUTO and TRUCK WHEELS

Wheels Repaired and Returned by Express Same Day.

THE EBERLY & ORRIS MFG. CO.
MECHANICSBURG, PA.



BILL ENDICOTT

Writes, "Car worked perfectly. All parts lubricated with Dixon's Automobile Lubricants in perfect shape after races (Indianapolis Sweepstakes)."

Write for "Lubricating The Motor" and sample No. 134-G
JOSEPH DIXON CRUCIBLE CO.
Jersey City, N. J.



TEDDY TETZLAFF

Writes that he "would rather pay \$5.00 per pound for Dixon's Automobile Lubricants than use any other as a gift."

"Lubricating The Motor" and Sample No. 134-G on request.
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THE PERFECT SIGNAL
OVER 100,000 NOW IN USE

WARNS WITHOUT OFFENCE—ALWAYS EFFECTIVE
NEVER CLOGS OR BALKS—SIMPLE TO INSTALL

COSTS \$7.00 TO \$10.00
NO MAINTENANCE COST

B-Line Guns and MacKae Blitz Spark
Plugs are Best.

THE RANDALL-FAICHNEY CO.
BOSTON, Mass.

Jubilee CHIME TONE **Horn**

JUBILEE (CHIME TONE)

"SILVER KING"



When looking for an automobile wrench set, remember that the adjustable ratchet wrench head on "Silver King" will allow it to be worked in out-of-the-way places where no other wrench can be used.

Insist on
"SILVER KING."
Accept no other.

Jobbers, ask for electros and prices.

C-M-B WRENCH COMPANY, 908½ E. Genesee St., Syracuse, N. Y.

NATHAN

Perfect fitting tire covers that are water and dust proof.

"PRESTO"
Price, regular, \$1.75.
Price, dem. rim, \$2.20.

"KEYSTONE"
Price, regular, \$2.00.
Price, dem. rim, \$2.45.

No. 36. Bag for one inner tube. Price 35c.

No. 37. Bag for two inner tubes. Price 55c.

Starting handle holder. No. 508. Price, 45c.

No. 508 A. Price 50c.

Magneto covers. No. 901, leather, \$1.75.
No. 902, leather duck, 60c.

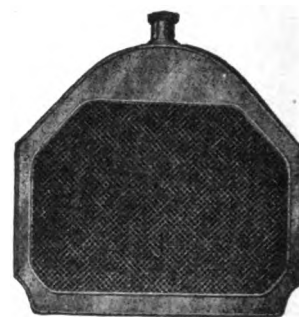
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Any article sent prepaid on receipt of price.
Money back if not satisfactory and returned within 10 days.

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Top Slip Covers a Specialty.

ALL STYLES OF LEGGINS.



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DIAMOND HONEY COMB RADIATOR

All radiating surfaces—no fins—one of the most efficient coolers made. Very strong and handsome. Built in any size and design, and for any truck, automobile, or aeroplane.

"WILL OUT-LIVE YOUR CAR"

Absolute satisfaction guaranteed
High class radiator repairing

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THE REAL WHISTLE
FOR AUTOMOBILES

Use it thirty days, and you would not be without it. If we are wrong you get your money back. Write for booklet

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"AVON" Blowout Patches

Built Like a Bridge

12 to 14 in. long—7 ply—extra heavy
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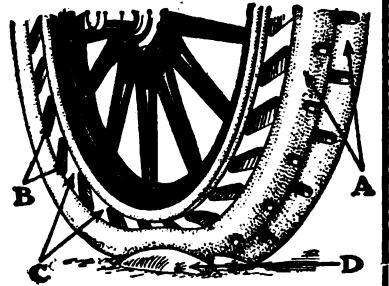
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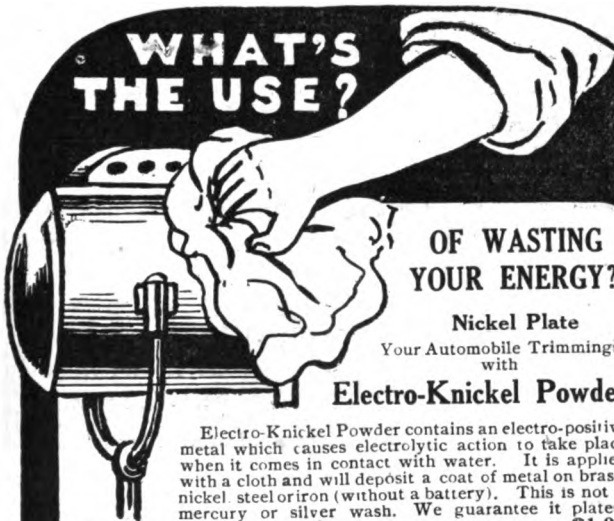
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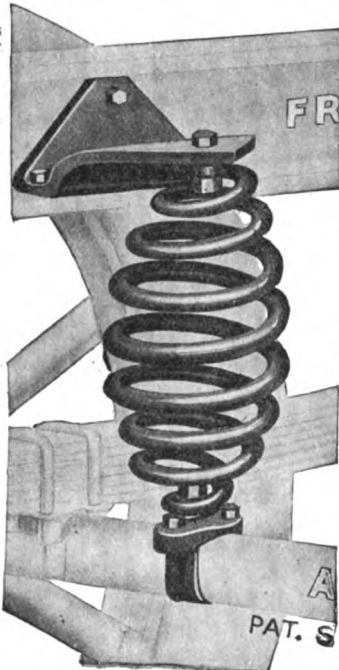
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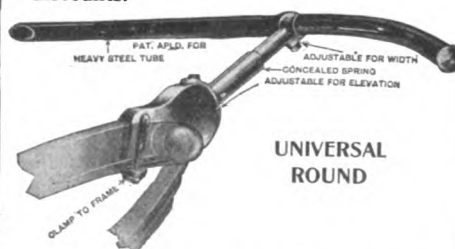
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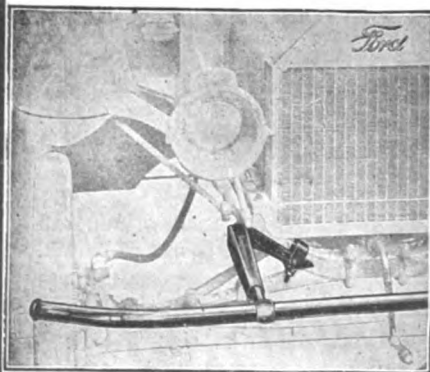
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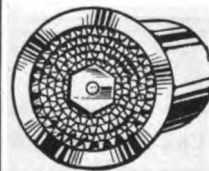
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Saves from 50 to 75% on oil and gasoline. Gives more power to the car. Stops back-firing and makes the car run smoother.

Give size of intake.

In Cold Weather the CRONE PRIMER will start the engine with one crank. No need of cranking an hour.

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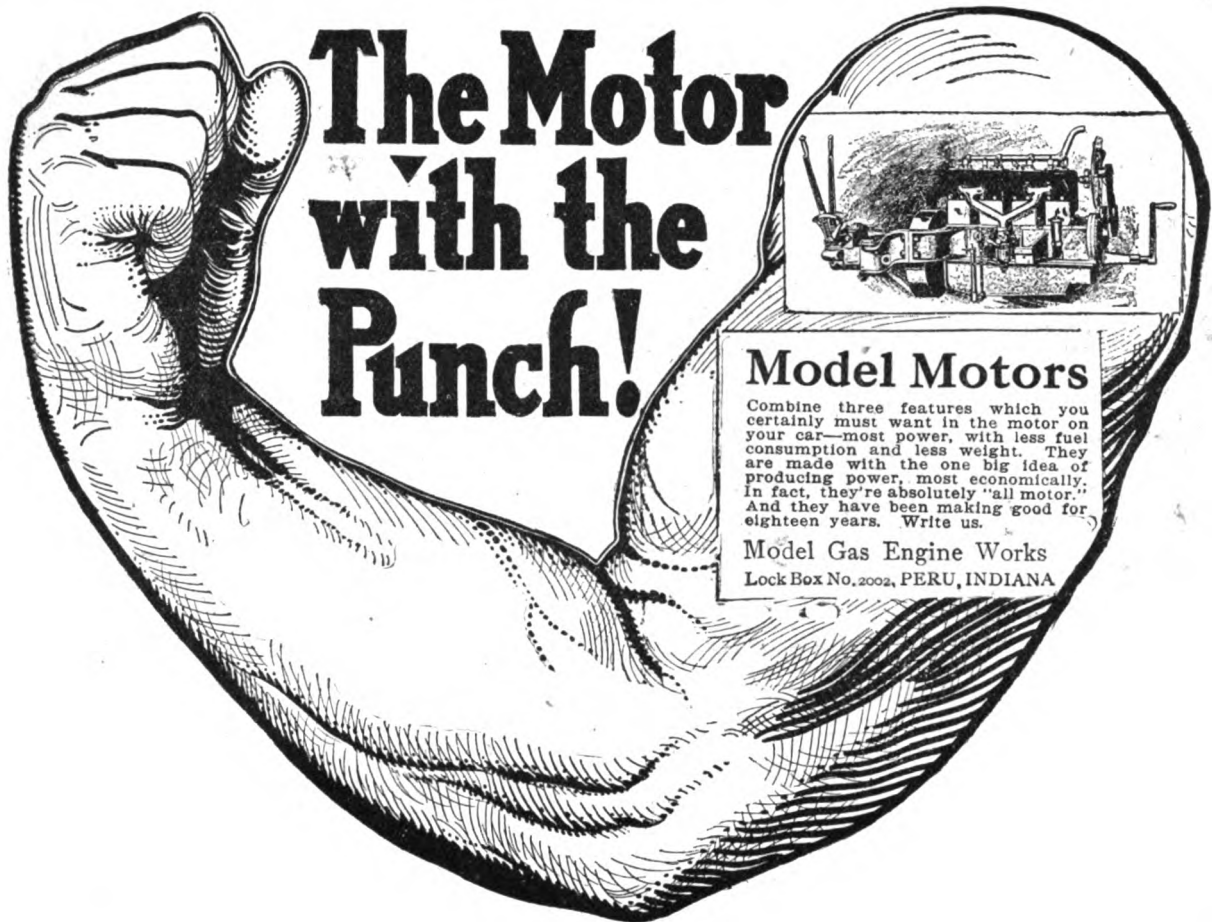
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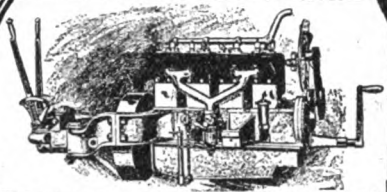
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Model Motors

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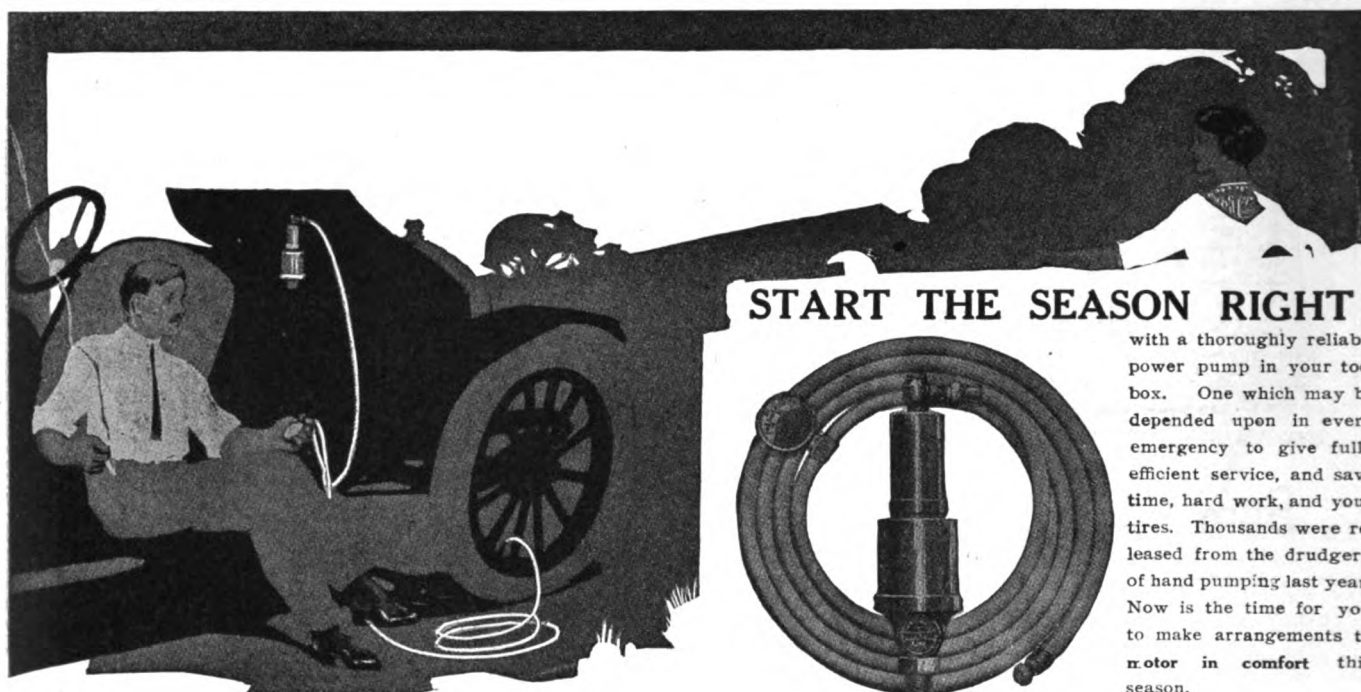
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with a thoroughly reliable power pump in your tool box. One which may be depended upon in every emergency to give fully efficient service, and save time, hard work, and your tires. Thousands were released from the drudgery of hand pumping last year. Now is the time for you to make arrangements to motor in comfort this season.

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TRY IT ON YOUR OWN CAR FREE BEFORE PURCHASING

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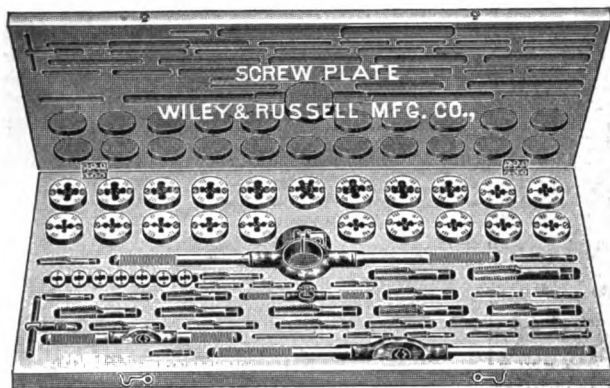
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Ask for Ford Model T Screw Plate.

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Maintains equal air pressure, which means no rim-cuts, no flat tires, 30% more tire mileage, 75% less tire trouble.



Saves weight, gasoline, trouble, time, money, and increases tire and car efficiency, and pleasure.

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WE ASK THAT YOU

DO NOT CONDEMN YOUR BRAKES

for squeaking and slipping when all that your Auto-Brakes need is a REX ANTI-SLIP BRAKE WAFER (only a penny a piece by the box of 25). They cure squeaking and make your oil-soaked, water-soaked or worn Auto-Brakes SILENT and SURE—immediately—and one lasts a long time; then a little water revives its action.

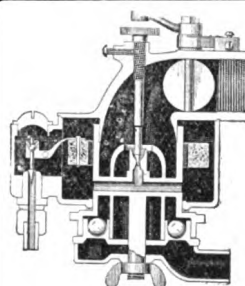
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10% to 25% Cut in Gasoline

or money back in 30 days.

Others are making tremendous savings in gasoline. Why not you? A. N. Smith saves \$2 every 10 hours on Hartford III on 20 cent gasoline. Read his letter. Auto owners getting 20 miles and more to the gallon. Its flexibility, speed and power amaze new users.

"4300 MILES WITHOUT A MISS."

That's what C. F. Lagen did with a Planhard on the "Dream," which won the race to Bermuda and back.

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Absolutely automatic.
No springs, levers or cams.

Easy, permanent adjustment. Gives increased power and speed with any gas in any weather.

Dealers Get my proposition.

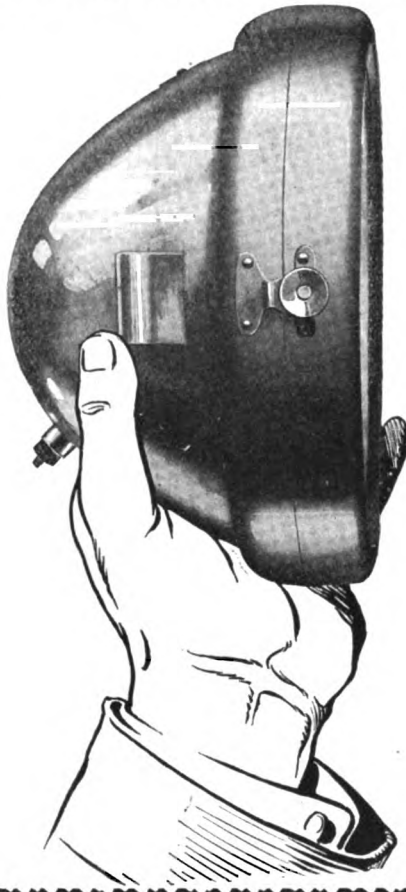
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Name.....St.....
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Engine.....Carburetor.....Size.....in.
Threaded? Flanged? Horizontal? Vertical?

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When you turn in your empty Prest-O-Lite be sure to get a genuine Prest-O-Lite in exchange. Because Prest-O-Lite Service means more than merely giving you a fresh charge of gas.

In addition to this, **Prest-O-Lite Service** includes putting every cylinder that passes through our hands in perfect working order.

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Remember that no imitator ever stayed in business long enough to build up a satisfactory exchange service, and that no imitator has ever stayed in business long enough to protect the customer's investment.

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Branch Offices and Service Stations in all principal cities.
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Every need of every autoist can be met by Lee Regular Tires; Lee Puncture-Proof Pneumatic Tires; Lee Zig-Zag Non-Skid Tires; or Leeland Tires—guaranteed in everything but specified mileage.

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LEE TIRE & RUBBER CO.

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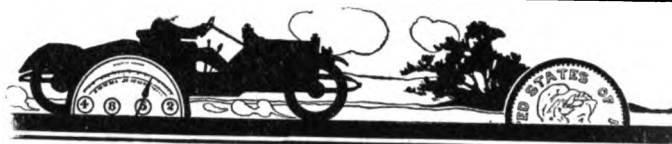
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It gives full details in connection with running gasoline engines, stated in simple language that anybody can comprehend. It contains numerous illustrations.

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insures full power, minim-
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The K-W MASTER VIBRATOR. Why?



Because the Master Vibrator does a great deal more than simply replace the four separate vibrators on a coil.

It is **NOT A VIBRATOR** in the ordinary sense, but a scientifically constructed **MAGNETIC CIRCUIT BREAKER** which times the spark more accurately than the ordinary High Tension Magneto.

It is so designed as to utilize the alternating current of the Ford Magneto and make the coil produce a **MUCH HOTTER SPARK** than it could produce with any other vibrator.

No matter what coil you now have, whether it has four vibrators or one, **THE K-W MASTER VIBRATOR** will give you:

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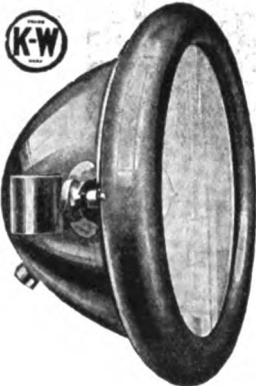
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FOR FORD CARS \$15.00
With Fly-Wheel Magneto



The successor to the gas tank. Current direct from Magneto.

The K-W Outfits manufactured for this purpose are not makeshifts, but are complete in every detail.

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1 pair complete Head Lamps.
2 Tungsten bulbs, 2 1/16" in diameter.

12 feet wire, all soldered to lamps.

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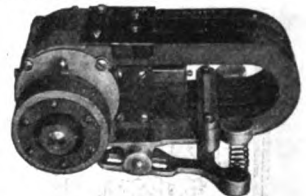
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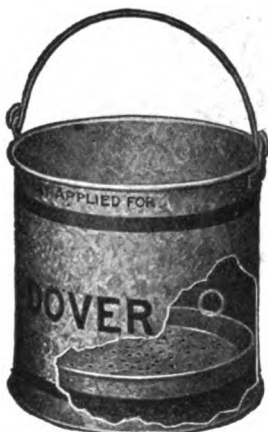
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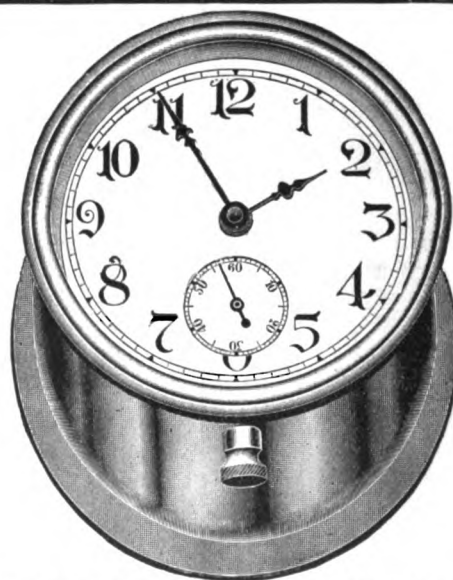
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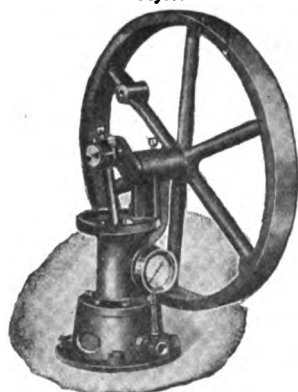
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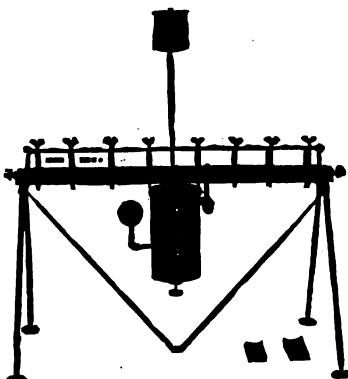


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 Made in Twenty Styles



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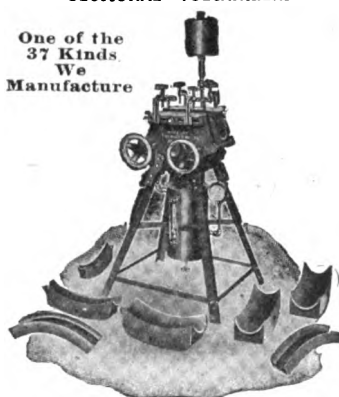
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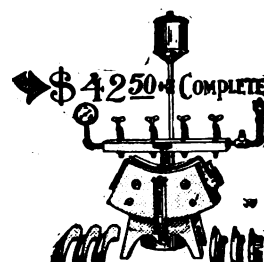
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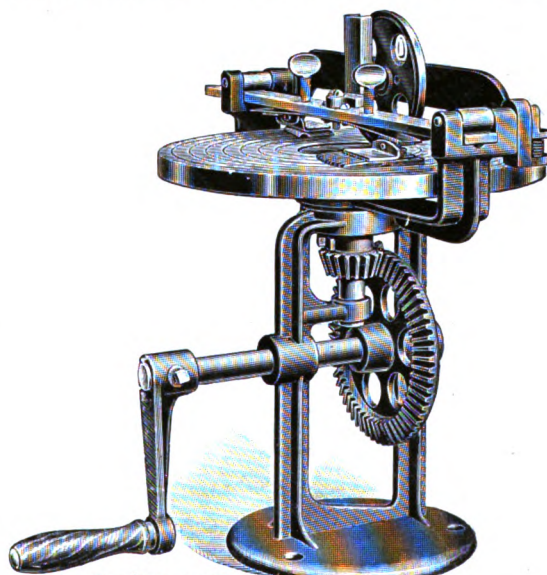
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